AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Andrews' Oscillating Engine.

We present on this page two illustrations of a double-cylinder oscillating engine, and on the second page a sectional view of a single cylinder engine of the same type, manufactured by Joseph Edwards, No. 414 Water Street, New York. These engines present peculiar advantages in simplicity, compactness, convenience, cheapness, durability and economy. They effect considerable saving in dead weight and friction. In the side view a portion of the frame and one journal box are broken away, and an end section of the trunnion-box removed for the purpose of showing all the working parts in their proper positions. The steam-chest, a portion of the cylinder, one cylinder-head with its stuffing-box, gland and gland-nut, a part of the piston-rod, the stub-end and strap are shown in section.

The cylinder A has two trunnions B B, working in two bearing-boxes C C, (one only of each being shown) and has a projection D, (shown in section) cast upon its lower side, extending the full length of the cylinder in the form of a segment of a circle having its center in common with the trunnion B and extending across the cylinder somewhat less than its diameter, but of sufficient width to allow of passages E and F through it of a proper size for the admission and exit of steam, and a sufficient surface in addition upon its convex face, to prevent the escape of steam between it and the concave face of the steam-chest G (also shown in section), with which it forms a movable steam-tight joint. The steam-chest G is of the same width as the projection D upon the cylinder, but somewhat longer, and has its concave face accurately turned, scraped and fitted to the convex face of D. The steam-chest G is rigidly secured in the frame H by the screw bolts I I passing through it, and by two set screws J J (one only being shown) under each end. It has two chambers in it, the inner one, K, for live steam, supplied to it through pipe L, and having an opening from it at M through the face of the steam-chest; the outer one N, is for the exhaust steam, and has two openings from it through the face of the steam-chest at O O′, and has the exhaust-pipe attached to it at P.

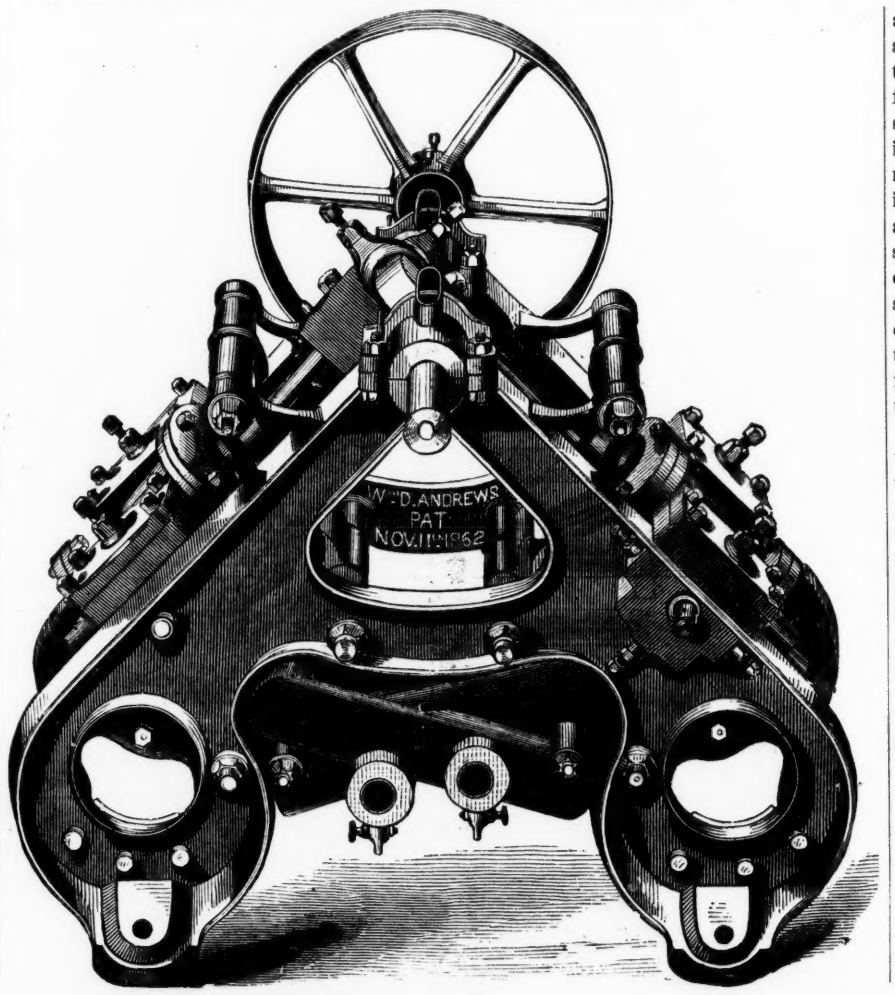
To enable the cylinder to oscillate in contact with the steam-chest without wear or friction, and still keep the joint between them steam tight at varying pressures, their faces are brought into contact, and there held under a light pressure of steam, and at the same time the set screws under the trunnions are adjusted so as to prevent the faces being forced nearer together by any pressure applied above. The corrugated spring U is inserted in the trunnion-box above the trunnion, and compressed by the set-screws above it. Steam of any pressure required is then admitted to the engine and the corrugated spring compressed sufficiently to prevent any escape from the joint. As the pressure of steam is decreased the elasticity of the spring carries the cylinder down, compensating for the contraction of the metal, but is prevented from carrying the faces into forceable contact, by the screws beneath the trunnion.

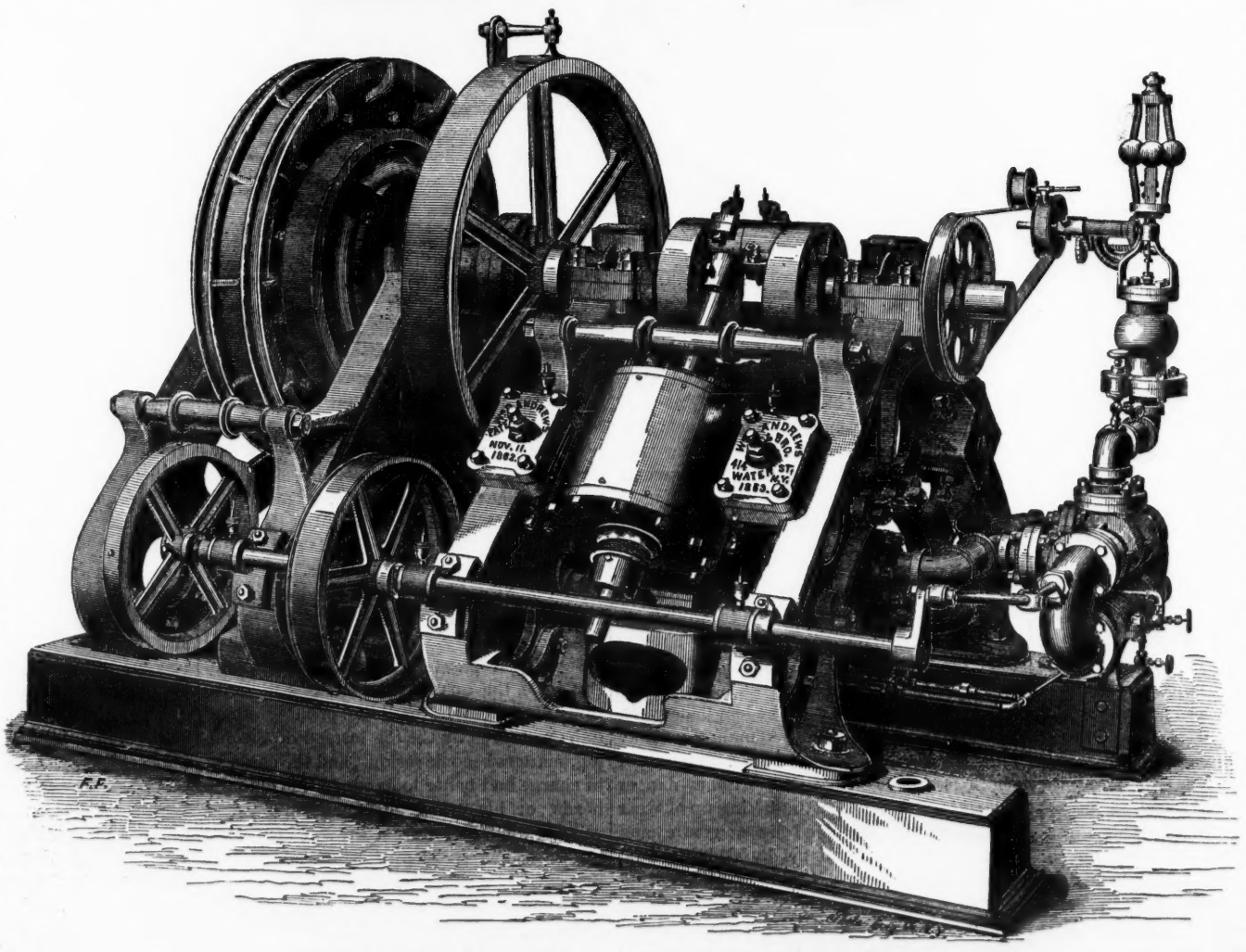
When the passage E is in communication with the steam-opening M, admitting steam to the front end of the cylinder, the passage F is in communication with the back opening O′ of the exhaust-chamber, allowing the exhaust steam to escape freely from behind the piston. When passage F is in communication with the steam-opening M, admitting steam to the back end of the cylinder, the passage E is in communication with the front opening O of the exhaust-chamber, allowing the exhaust steam to escape freely from the front side of the piston.

Should the engine be required to run in the opposite direction, it is only necessary to transpose the steam and exhaust pipes, making the outer the steam and the inner the exhaust chamber. When engines require to be reversed while running, a reversing valve is applied, which instantaneously reverses the steam and exhaust, and by the use of which the double engines, which are connected to one crank at right angles to each other—having no dead point—can be reversed in one second, when running 200 revolutions per minute under a full head of steam.

The piston-rod 4, which is of steel, is extended through a stuffing-box in the back cylinder head, by which means the piston is sustained and all wear is transferred from it to the rod, and thence taken up by the packing—keeping the piston at all times perfectly centered. By this arrangement, the builder dispenses with all piston-springs and still maintains a tight piston, with a great saving of friction and wear in the cylinder, as well as of time, and expense of adjustment and repairs.

The stroke of these engines being very short—in some sizes only two-thirds the diameter of the cylinder, and in no case exceeding it—the extension of the rod





END AND PERSPECTIVE VIEWS OF ANDREWS' OSCILLATING ENGINE.

through the back head adds but little to the entire length of the engine. The same velocity of piston is obtained as in long-stroke engines, by increasing the number of revolutions; which, in the absence of connecting rods, cross-heads, slides, eccentrics, slide-valve, &c., is done without inconvenience or increased liability to derangement. They occupy very little room and require little care. They are complete within themselves, requiring no special foundation or balance wheel pit. Every engine is tested before leaving the shop, and can be transported without being taken apart, and on arrival at its destination can be put in operation without the loss of a day. The single engines require balance-wheels of only one-eighth to one-fourth the weight of those required for ordinary engines; while the double engines require none at all.

Their entire weight, it is claimed, is only from one-tenth to one-fourth that of engines of ordinary construction having the same power, while they are equally strong and durable. They are claimed to be economical in first cost and in the consumption of steam.

Engine Proportion and Construction.

Editor American Machinist:

In last week's number of the AMERICAN MACHINIST, I had something to say in regard to bed plates for horizontal engines; and in this writing, I will endeavor to give my ideas of proper construction of the detail of modern horizontal engines, requisite in the machine for the faithful performance of its work as a motor for large manufacturing establishments, especially those appointed for spinning and weaving, and those employing large numbers of operatives.

Within a distance of twenty-five miles from New York City, there are at least thirty factories that employ over three hundred hands; six of these have an average of over five hundred. A stop of thirty minutes, caused by hot journal slides, or any part of imperfect design, entails a loss to the owners of from thirty to fifty dollars. It cannot be denied that this trouble is constantly occurring, and several cases have come to my notice within the past six months—one in particular, that of a five-hundred horse-power double engine in constant trouble from hot slides, and will continue to be so until the surface on cross-head gibs is made equal to the labor, or according to any of the well-known rules on the subject of friction and lubrication. Then the water pans (I will suggest a more appropriate name—"bath-tub") can be removed from the slides, and the owners of this costly machine can settle down to business without fear of from two to five stops a week. The slides and cross-head are not the only seat of trouble when treating of wearing surfaces is considered. The *hot* cross-head pin and crank pin are two common evils that our practical engineers deal with often and seven out of every ten cases are due to bad proportion at these vital points of transmission, the trouble being that the builders make their cross-head pins not only too small in diameter, but entirely inadequate as to length. Now when the cross-head is *properly* guided, and provided with *complete* adjustment, this pin should be made one and one half times its diameter in length. The pin itself should be made separate from the cross-head proper, then as soon as a flat or oval form from the oscillating movement becomes perceptible, the pin can be turned one-fourth the way around in cross-head, thus offering a new and perfect surface to receive the wear.

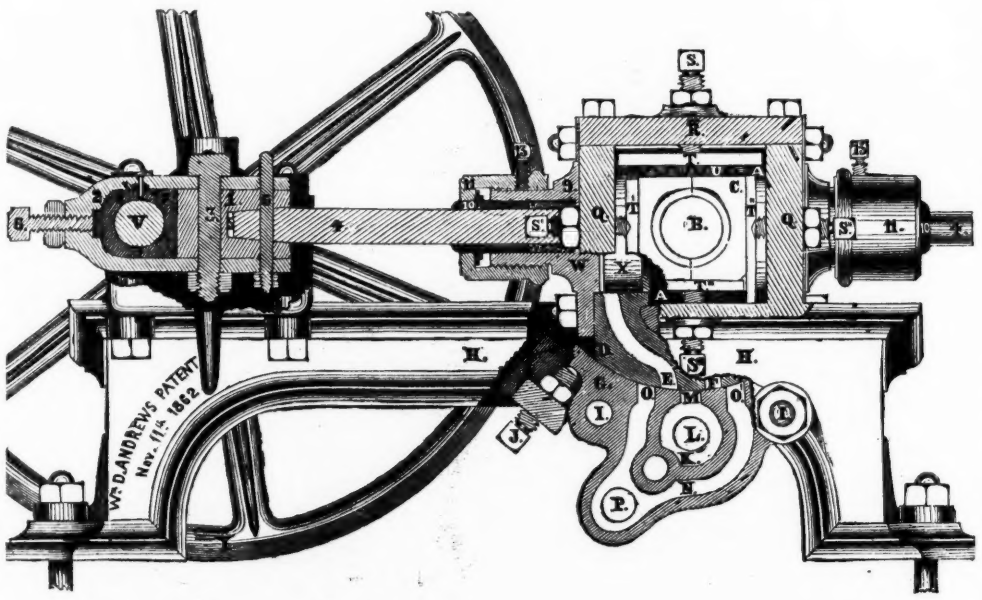
By making the pin long, we approach as near as possible (with a single end rod) the old forked connecting rod, still in use in Europe, and always free from heating.

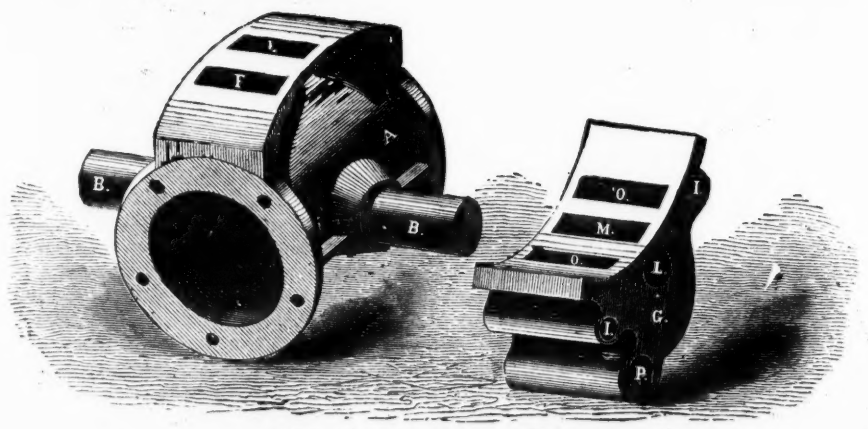
The troublesome crank pins are, on the other hand, the *longest* ones. The great mistake is made in having too much distance from center of strain to edge of support. Most builders make their crank pins from one and one quarter to one and one half times the diameter; and of course the long distance from crank face causes the pin to spring, and every sixteenth of an inch in length aggravates the disease. I have a crank pin running on a hundred horse-power engine, its length being twenty per cent *less* than the diameter; at the same time by the increased diameter the surface is ample for one-hundred and fifty horse power. *The pin was never hot,*—but the trouble of all troubles comes when the heating selects the main crank shaft journals for its point of attack; this is liable to occur on any engine of size from the moment it makes the first revolution to the time it is ready for the second hand machinery dealer. Not always from badly proportioned journals and boxes, but from the fact that not one in ten of our engine builders provide any vertical adjustment for the crank shaft it *will* wear *down* from its own weight, and, that of the pulleys or fly wheels attached to it, and no man living ever saw both ends go down *alike*. Almost invariably after three months running, the back end will be the lowest from one-eighth to three-eighths of an inch, most of this being due to the settling of the foundation. When the shaft leaves its horizontal, not only does the heating reach both main bearings, but of course the horizontal of the *crank pin* is also affected, and it at once falls into line and makes the agony complete, when twenty-five dollars extra expense on each box, in the way of a screw or wedge vertical adjustment, would place the shaft on its original level plane without loss of time or damage of any kind. In concluding this article, I will mention the connecting rod, and leave consideration of the other details for the near future.

There are many good devices for taking up the wear of connecting rod boxes, but the good kinds of adjustment are not the *cheap ones*. In the first place, the adjustments should be so arranged that the length between center of pins will always remain the same. This assures the least possible amount of piston clearance in cylinder without danger of striking heads; then the taking up of wear should be accomplished by a gentle and moderate motion, and *not* by sledging on a key by main strength, thereby springing and otherwise injuring the brasses.

The moderate adjustment is not only safe on the brasses but safe in its working; it is never liable to drop out while the engine is in motion, and this is an item of vast importance with our new rapid motion machines. The *weight* of connecting rod at center and at crank end requires the most careful consideration, but is slighted too often in this respect I have seen a rod on a one hundred and fifty horse power engine 20×48, making sixty-five revolutions per minute, springing by actual measurement $\frac{3}{16}$ of an inch at the center at each downward throw of the crank, making the necks of this rod liable to fracture at no distant day. Not counting the injurious effect on the lower slide, twenty-five per cent. less weight in this case would have given ample strength.

WM. H. HOFFMAN,
July 11th, 1879. *Passaic, N. J.*





VIEW OF CYLINDER AND VALVE.

Priming—Its Cause and Remedy.

BY J. O. BUERK, M. E.

The worst defect a sound boiler can have is a disposition to prime; in other words, to send water as well as steam to the engine. Whether a boiler primes much or little, the It is to be remembered that in the up stroke three or four inches of water may lie upon the piston, for which, of course, no possible exit can be provided until it actually comes in contact with the cylinder cover. There is no approximately perfect elastic medium present to take up the blow, and the question whether or no there will be a breakdown resolves itself into the problem whether the mass of water can escape in the short space of time occupied by the piston in completing its stroke or not. In like manner, if the water lie on the cylinder bottom, nothing can prevent a certain amount of shock, due to the first contact of the piston with its upper surface. It is possible that if a small quantity of vapor did not undergo compression between the piston and the fluid, and thereby at least tend to reduce the percussive strain, and to open the valve before the piston actually touched the water, a breakdown would be a matter of constant occurence. Any one who has watched an engine fed by a boiler priming badly, and noticed the violent strains to which every part of the machinery is subjected at the termination of each stroke, must perceive that, even in the absence of an actual catastrophe, mischief is done, and injurious influences are brought to bear upon it which must tell, sooner or later, for the worse. It is quite possible that fully one half of the casualties which take place at sea during the year are, either directly or indirectly, due to priming, to say nothing of the wear and tear of valve faces and piston rings brought about by the intrusion of mud, grit and hard scale carried over by the water. The marine engine is here more particularly mentioned because it represents the largest dimensions which steam machinery assumes, while the marine boiler, from its size as compared with its power, and the peculiar conditions under which it is necessarily worked, usually manifests a disposition to prime which can hardly be paralleled on land, even by the locomotive.

An evil of such magnitude and importance could not, of course, fail to attract a great deal of attention, and many attempts have been made to investigate the causes of priming and to provide a remedy. The moment we commence such an inquiry we find ourselves surrounded by a series of puzzles, enough to baffle and dishearten the most ardent seeker after knowledge. Facts there are in plenty. Every sea-going engineer possesses a stock gathered from his own experience, but the moment we attempt to generalize on these facts, and to examine the relations which they bear, we find ourselves utterly at fault. The very conditions which conduce to priming in one case are those which serve to arrest it in another. Each engineer has his own views on the matter, but these usually clash with those of his own profession, and at this moment every one who has looked the difficulties surrounding the subject honestly in the face, must admit that the causes of priming are shrouded in mystery, which is as dense now as it was years since.

In order to convince the most skeptical that this is really the case, it is only necessary to select a few of the most familiar facts connected with the subject, and from these to attempt to construct a satisfactory theory. Thus, it is well-known that new boilers almost always prime more or less, and the evil diminishes day by day as they become older. But it is also known that boilers will sometimes not prime until they have been at work some time and have become foul. Why is this? Why should a boiler filled with clear water manifest certain phenomena which are proper to boilers containing dirty water, and which actually cease to be manifested as soon as the water becomes foul—that is, as soon as it is brought into precisely the same condition as those in another boiler, and in it inducing priming?

Again, a set of four or more marine boilers, all absolutely identical in construction and fed with the same water, one will prime

bravely for a time, while the rest supply dry steam. This fact is patent to any engineer who has conducted a trial trip, yet a few days work may suffice to bring about a complete change, the tendency to prime leaving the first boiler and possibly appearing in another, without any ostensible reason. On land a small quantity of grease in the feed water will usually cause the boiler to prime. At sea a favorite remedy consists in introducing a few pounds of tallow into the defective generator. In nine cases out of ten perhaps, this may be productive of immediate good. In the tenth, this remedy (?) only serves to aggravate the evil it is intended to remove. The transition from tallow to soap is not very violent, yet the introduction of a few gallons of strong soap-suds, sometimes used with the intention of loosening the deposit, will nearly suffice to make a boiler empty itself by priming in half an hour.

Coming to mechanical expedients, we find that the doctrine is very generally received that perforated plates placed at the bottom of a high steam dome will reduce priming by retaining the spray, but permitting the steam to pass. At least one instance, however, fell under the writer's observation in which a boiler notoriously given to prime, was almost cured by the removal of a set of perforated dash plates from the base of a very high dome. From such anomalies as these it is almost hopeless to construct anything like a general theory of priming, or to suggest a means of preventing or mitigating it, which shall be universally applicable. In point of fact it is better that the investigator should endeavor to divest himself of every impression, conveyed by a knowledge of those conflicting phenomena, and endeavor to single out, as far as possible, those facts which invariably hold good, or nearly so under all circumstances. Unfortunately these are not very numerous, but they are very simple. As a rule, a large steam space reduces priming: in the first place, by giving the water time to separate from the steam; in the second, by preventing sudden changes in the pressure above its surface. Again, a large water surface acts beneficially, by providing an extensive area from which the steam can eliminate itself quickly without carrying up much water with it. Furthermore, in a steam boiler, as in a well-managed shop, there should be a place for everything and everything should be in its place. That is to say, water should not encroach upon the steam space, and this condition can only be secured by providing for a vigorous circulation. After all, these statements, although substantially correct, do not apparently come to mind; and yet, on these alone can we base any rules for the construction of boilers which shall possess the power of supplying dry or nearly dry steam.

It may here prove useful to consider for a moment the nature of the phenomenon from which priming apparently results. Priming is in conventional terms nothing more than a boiling over. The steam as it is generated, instead of escaping freely from the water, is entangled with it, and carries over in its grasp a certain portion of the fluid Now it is not very easy to determine the exact condition of a mass of water heated up to the boiling point proper to the pressure to which it is subjected. We know that steam is produced by the separation of the molecules of the fluid, and that a comparatively small addition of caloric will suffice to convert a portion of a mass of water already on the verge of ebullition into steam. The elastic fluid is in practice produced as close as possible to—in short, in contact with—the heated surfaces of the furnaces and tubes; but it is only by a species of accident that any one portion of the mass of water comes into this contact to the exclusion of any other portion It is tolerably clear that, so to speak, the whole mass of water must be in a condition approaching that of unstable equilibrium, and that it is only prevented from all untimely flashing into steam at once, by the fact that it is a comparatively slow conductor of heat, that different portions of the mass are better situated for taking up the heat than others, and that those so taking it up at once become steam, and depart to the surface. Still there is not much room to doubt that the molecules of heated water have lost some of the power of that grasp with which they clung to each other when cold, and that, as a result, steam just formed can hardly fail to carry with it something which is not exactly water or steam—a finely divided mist in fact, hovering on the verge of either condition; and this, unless time be allowed for its precipitation, finds its way to the cylinder as one form of priming. The process by which large bodies of water find their way there is somewhat different. The boiling point at the bottom of a deep boiler is sensibly higher than that at the surface, and thus the fluid may become heated, if detained in contact with a furnace crown, to a point higher than that at which it would boil near the surface When the circulation is imperfect water may thus be detained for an appreciable space of time, and on subsequently rising, it will, possibly, when still 6 in. or 8 in. from the surface, flash into steam, carrying the superincumbent water with it, lifting it, as it were a sheet from the water below, and hurling it directly towards the point of least resistance, viz., the orifice of the steam pipe. Once within this, of course, there is no return.

The priming which ensues the moment a vessel leaves the sea and begins to take fresh water into her boilers may, perhaps, result from a different train of events. The fresh water entering rises through a mass of liquid, which, although not itself necessarily boiling, is, nevertheless, heated to a much higher boiling point than that at which fresh water would boil under the same pressure. The result is that the feed absorbs heat directly from the salt water, instead of waiting its turn to come into contact with the heated iron, and, flying into steam, carries much water with it. Phenomena of a similar character, but magnified in degree, can be produced by injecting small quantities of water beneath the surface of a melted fusible body such as tin. Some time may elapse before the solution of salt is weakened by blowing off, and, so long as any decided difference in density exists between the contents of the boiler and the feed, so long will priming continue as a rule. Neither this, nor the theory preceding it, can reconcile the hopelessly discordant statements advanced by engineers, which was alluded to in the first paragraph of this article.

From all this confusion and mystery it is fortunate that certain deductions have been eliminated which, although limited in their application, nevertheless show the only correct principles on which to proceed in the construction of boilers capable of supplying dry steam. Few and simple as they are, they cannot always be carried out without the expenditure of a skill and originality of thought which are not very common.

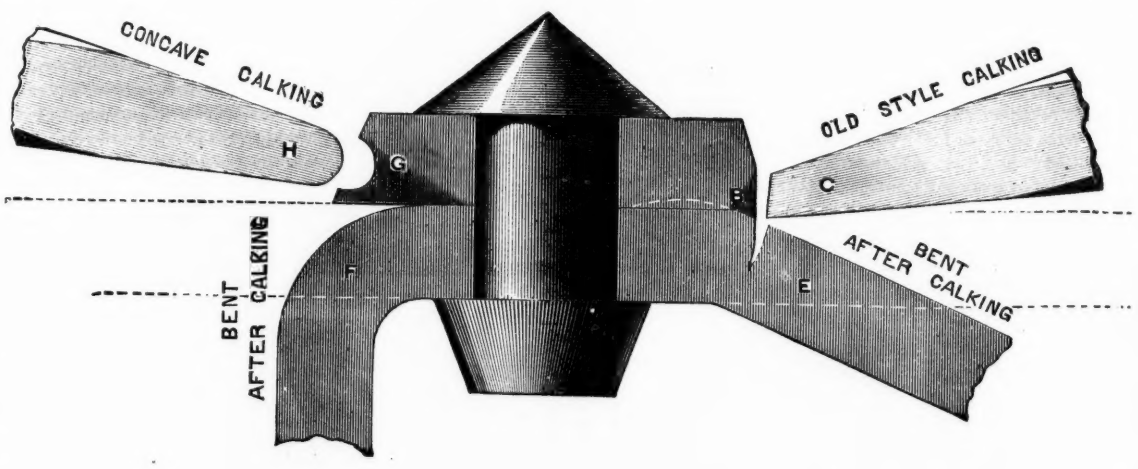
Philadelphia is to have an elevated railroad to the center of the city, connecting with the Pennsylvania road by the way of Filbert street.

Improvements in Calking.

BY STEPHEN ROPER, ENGINEER.

The primary object of calking is to render the seams of steam boilers, tanks, ships, or other metallic vessels, containing vapor or fluids, steam, air, etc., water-tight. The oldest and most common method employed for accomplishing this object is to chip or plane the overlapping sheet to an angle of say 80°, and then, by means of a hammer and tool, drive up the metal until the angle of the upper sheet has assumed a form similar to that shown at B, Fig. 1. Any one who is accustomed to this style of calking is well aware that the parts of the material made to impinge on the edge of the sheet, cannot be made to assume equal angles with the sides in consequence of its form. As a result, it cannot be kept in contact with the under sheet, the effect of which is, that under every blow of the hammer in the hands of the calker, the tool violently slips upwards upon the inclined surface formed by chipping on the overlapping edge. It must, therefore, be made with one of its angles more acute than the other, in order that the compressed portion, as shown in the darker shade in the figure, may be given a right angle, to prevent the slipping away of the tool.

With a tool of this form it is impossible to thoroughly upset, or calk the metal of the upper sheet without more or less injury or scoring of the under sheet; as the general direction, in which the blow of the hammer is transmitted to the iron, is through the axis



of the calking-tool This line will, if produced, pass through the under plate a little beyond the further side of the rivets, while the acute angle of the tool lies next the plate; for this reason the ordinary tool in the most skillful hands, never fails to inflict permanent injury on the plate. It has a tendency, not only to destroy a part of the material of the under sheet, but to force the overlap away from the under sheet, exposing the metal of the lap—on the line through the centers of the rivet holes—to a tremendous strain; and, as the surface of the under side of the rivet-heads is small compared with the calking, and as the conical heads of the rivets are such as to leave a comparatively thin and yielding edge, the metal of the lap is, in a majority of cases, lifted off the under plate, with a tool of the form shown at C, which is the ordinary calking-tool.

Nor will this be the only injury inflicted on the under sheet, because it has been demonstrated by experience that wrought iron under a process of hammering, rolling or compression loses its resilience, becomes crystallized and nearly as brittle as glass. As a result, the sharp edge of the overlapping sheet, which became crystallized from the action of the ordinary calking tool, is driven into the softer metal of the under sheet, thus causing indentation, scoring and channeling, which, by destroying the skin of the material, impairs the tenacity of the metal, weakens the whole structure, and, instead of being a safeguard, becomes a source of danger. It is well worthy of the attention of any one who takes an interest in the growth of the mechanical arts, or in the lives of their fellow men, to visit an establishment where old steam boilers are taken apart, as he could satisfy himself that all of them had received permanent injury in the process of calking, and some of the finest and most expensive ever constructed in the country had been actually ruined while exposed to the action of the calking tool. The writer has been connected, at different times, with two of the largest boiler establishments in the country, one locomotive and the other marine, and though the character of the work done in these shops was equal, if not superior, to any in the country, he can say, from his own experience, that he never knew a boiler to be constructed in either which was not permanently injured in the process of calking.

Now, the question may naturally be asked by persons who have never given much attention to this subject: Is it not possible to calk a boiler by the ordinary process without injury? The answer is: No; because it is impossible to do so without abrading, indenting or scoring the material; and, as many will not perceive why this should affect the integrity, impair the longevity, and eventually hasten the destruction of the structure, we will endeavor to explain it by a familiar and common place illustration. When a blacksmith wishes to break a bar of cold iron he cuts a nick all around it; then, by giving it a smart blow, the piece drops off, evidence of which may be seen at E, as the material commenced to give way at an angle of about 20°, while F was bent to a right angle without showing any symptoms of fracture; again, when we desire to cut a square of glass, all that is necessary to do is to disturb the skin with the point of a diamond, after which it may be easily separated at that point. It is so also in the case of boiler plates—any disturbance or injury inflicted on the skin of the material can never be compensated for by any known mechanical process.

The object of the foregoing remarks is simply to call attention to one of the most important improvements ever made in steam boiler construction—Connery's Patent Concave Calking—as shown at G, and which has been pronounced by some of the most talented boilermakers in this country to be one of the most important inventions of the age. Besides, its novelty and simplicity are such as to make one wonder why this process had not been thought of before; but the intelligent mechanical inventor is well aware that it was ever—"thus." Many inventions that have conferred great advantages on mankind, and rendered such aid to civilization, are simple, easily controlled and managed.

The advantages of Connery's concave calking are: that it is impossible for the most inexperienced workmen to either alter the character of the material, disturb, compress, dent or gall it, in the process of calking, and that, while it is far superior, in point of permanence, to any other known process, the iron of the lap retains its ductility and resilience, which fact has been demonstrated by a great number of experiments under the most varying circumstances. Besides, as the tool shown at H commences on a smaller surface for indentation of the edge, it must result in compression or condensation of the iron of the lap to a much greater depth than is possible with the old method; it tends to bring about a more permanent strain upon the iron through the line of rivets. All those who wish to establish a reputation for good boiler work should adopt it, and persons contracting for new boilers should make it a specialty in their contracts that this method of calking should be employed, as it insures at least 25 per cent more durability in the structure than if the ordinary calking was used, while those that take an interest in the lives and property of their fellow men should advocate its general use. Recent investigation has shown that some of the most terrific boiler explosions that ever occurred in the country were induced by the old, barbarous custom of calking. This being the case, intelligent people will naturally inquire

why steps were not sooner taken to remedy the evil; but the cause may be easily understood, as there have always been more vagaries associated with the steam-boiler and steam-boiler explosions than any other subject connected with the mechanical arts.

As a result, public opinion has been perverted on this subject, so that it is only within a few years that men have begun to investigate the subject intelligently. No one is to blame for errors in judgment, providing he is guided by such lights as the intelligence of the age has brought within his reach. Men only become culpable when they persist in a course that endangers the life and property of their fellow man, after the evil and the remedy have been pointed out. Such is the case in regard to the invention that forms the subject of this article. There are thousands of boiler makers in the country that admit the superiority of the concave calking over the ordinary method, and yet refuse to adopt it, on the ground that their fathers used the old style, and they consider it good enough for them. Whenever any class of persons become so benighted in their views as to reject an important invention, or life-saving apparatus, because it was not employed by their forefathers, they are enemies to real progress, and the world is better without than with them.

This method of calking has been adopted by the great Baldwin Locomotive Works, Philadelphia, Pa., as well as by the following establishments:

Rogers Locomotive and Machine Works, Paterson, N. J.

Danforth Locomotive and Machine Works, Paterson, N. J.

Rhode Island Locomotive Works, Providence, R. I.

Pittsburgh Locomotive Works, Pittsburgh, Penn.

Schenectady Locomotive Works, Schenectady, N. Y.

Brooks Locomotive Works, Dunkirk, New York.

National Boiler Works, Philadelphia, Pa.

West Point Foundry, Cold Springs, N. Y.

R. H. Thurston, Stevens' Inst. of Technology, Hoboken, N. J.

Charles E. Betts, Paterson, N. J.

George Fox & Son, New York.

William Ingram, Providence, R. I.

Norris Iron Company, Norristown, Pa.

Dickson Manufacturing Co., Scranton, Pa.

Philada. Wil. and Balt. R. R., Wilmington, Del.

Dickson Machine Co., Wilkesbarre, Pa.

H. B. Bigelow & Co., New Haven, Ct.

Western Iron Boat Building Co., St. Louis, Missouri.

Cobanks & Theall, New York Iron Works, New York.

Delamater Iron Works, N. Y.

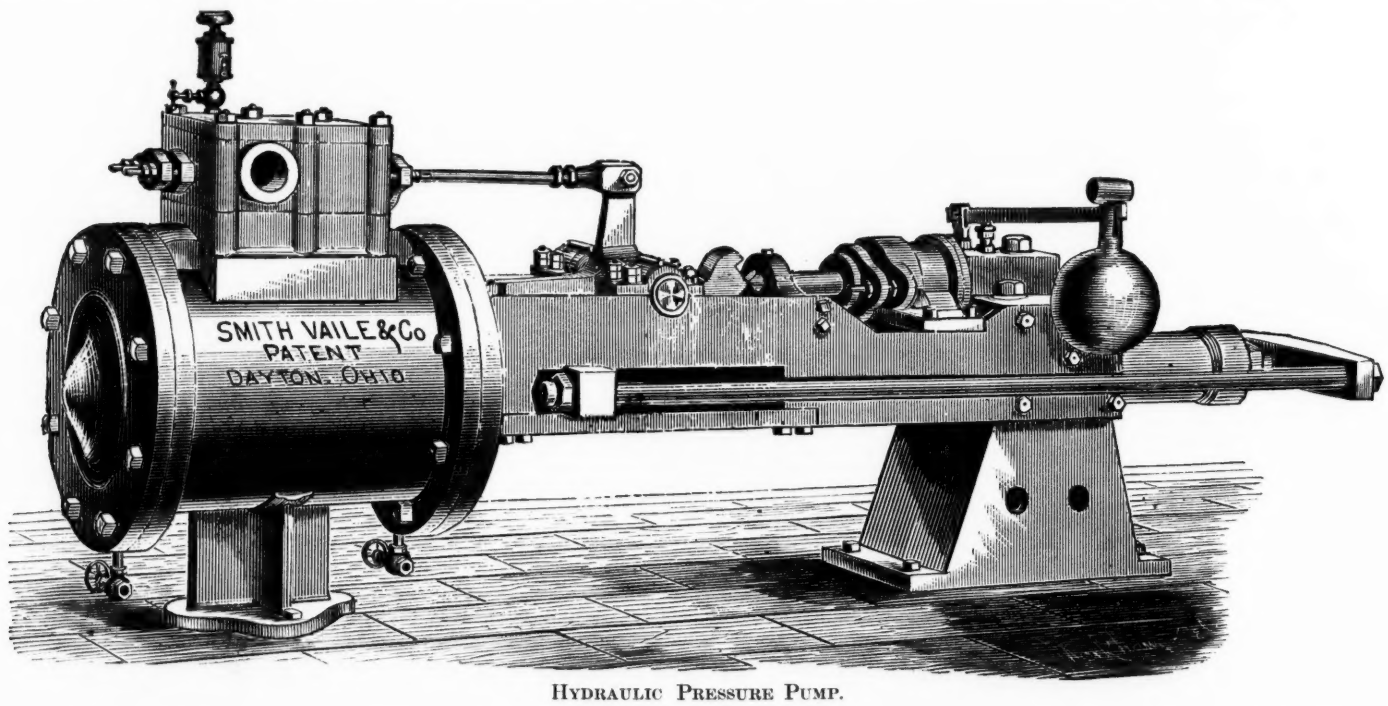
Erie City Iron Works, Erie City, Pa.

Frick & Co., Waynesboro, Pa., and others.

For further particulars and circular, address James W. Connery, Boiler Department, Baldwin Locomotive Works, Philadelphia, Pa.

Hydraulic Pressure Pump.

The accompanying engraving represents a peculiar style of hydraulic pressure pump recently introduced by Smith, Vaile & Co., Dayton, Ohio. This pump is especially constructed for working all kinds of hydraulic presses where great power is needed. It is adapted to use in testing iron pipe and tubes, pressing tobacco for exportation; also, in paper mills, hat factories, steel works, and all operations where hydraulic pressure is required. It is direct and double acting, and works direct from the steam cylinder. This pump is claimed to be compact, simple and durable, and to give any pressure required. The diameter of the steam cylinder is 14 inches, diameter of plunger 1¼ inches, length of stroke 14 inches. Every pump is tested to 9,000 pounds pressure per square inch.



HYDRAULIC PRESSURE PUMP.

Extracts from Chordal's Letters.

Mr. Editor:

* * * In a late letter to you I assumed the privilege and exercised the power of questioning the policy of John Doe and Richard Roe starting shops simply because they had devised a new machine. Their machine failing, or being supplanted by others, they are forced to follow general lines of trade and add to a destructive and distressing competition in a trade probably overdone. The destructive feature of such competition is its best feature. Far better to be forced to yield to the inevitable and quit, than to be able to demoralize trade by a bare existence whose only result is to weaken prices. The survival of the fittest is a just and natural law, and it is not at all contrary to a broad spirit of generosity to wish to see those whose very existence tends to general suffering yield in submission.

* * * One thing which encourages Messrs. Doe & Roe is the conservatism of established manufacturers. With all the well-known conservatism of foreign manufacturers, we often find them worthy of imitation in the matter of holding on to their prerogatives as makers of things. In a late catalogue issued by Tangye Bros., London, I notice in the preface an invitation to inventors and others to come to them with any thing whose manufacture will be justified by the probabilities of a market.

With all the originality of the machine trade in this country, it must be acknowledged that too often the inventor finds manufacturers indifferent, and is forced to work the market on his own account. His trifle is not enough to justify him, but would be an important element in the catalogue of an old concern. I do not mean to charge indifference upon manufacturers generally, but I do mean to say that in many cases manufacturers are loth to touch a thing which originates outside their own premises. I think I am justified in saying that those contrivances of the Gentiles, which by their apparent merit lead disinterested manufacturers to espouse them, are most always successes, and that home-devised arrangements can never be freed from an appearance of selfish prejudice, which detracts from the force of every argument advanced in their favor. I never mind setting up my own awkward experiences for the benefit of the trade, and am willing to stand for an illustration of my text.

Years ago, I was out continually, as a journeyman, erecting new work, in most cases being steam machinery in mills, factories, and lead mines. Two systems of pipes in such jobs are always the same, to wit: the supply pipe from well to supply pump, thence to tank; and the feed pipe from tank to feed pump, thence to boiler. These jobs were often hundreds of miles from a shop and the outfit of tools taken along was often taxed to form novel combinations of original tools. As a matter of course, a great deal of judgment had to be used so as to take as much suitably connected piping as possible along. The exit valve for the tank connection of the feed pipe was one of those pieces always taken. Every country machinist knows that valve, if it can be called a valve. It must be built up out of a piece of pipe having a long thread, a tin-shop strainer soldered to a coupling screwed upon one end; a globe-valve and elbow and nipples screwed to the other end; and thick rubber gaskets and specially forged lock nuts run upon the body. With such a rig one may feel prepared to meet a tank made of sheet iron, or six-inch wooden staves. But what a thing that is to have to build up in that manner, and how ugly and inefficient it is when done. The valve freezes four times per winter, and a new one must be put on, and for that reason an elbow is used instead of an angle-valve, angle valves being hard to pick up in a hurry. An attempt to put the valve inside the tank involves trappy and unreliable rods to work it. I made such things as this till I got sick of it. I found them entirely too expensive and defective, so I got up a new article of manufacture in which the whole thing was got in good shape, with the valve inside the tank and the hand wheel outside. It had a downward outlet and a malleable strainer. The body malleable, the valve brass, and long brass nuts. The thing could be sold for the price of a globe valve. No such thing could be made in a machine shop so I opened up on supply manufacturers. I tackled the best men in the country with my sketch and long letters detailing its merits. They all thought it very nice and so on, but did not remember ever having had a call for one. A fine idea! Who ever had a call for *anything* of that character before he put it on the market, and besides that, engine men know what these supply men make just as well as they do themselves, and are too smart to order a thing they know ain't made. I don't put in any tank valves to speak of now, and, of course, dropped the matter when I could not help myself. I might have done as the subjects of my discourse do, and gone into their manufacture; I would have found that that would not pay alone, so I would have been forced into staple work. My capital, barely sufficient for the tank-valve business, would hardly stand the stretch, and, as a consequence, I would soon have found myself trying to get bread and butter out of an imprudent and uncalled for competition. In such a business, I could continue to vitiate prices without vivifying my own trade in the least. I would be simply an excrescence upon the trade and my best friends, who, if they cared for the greatest good to the greatest number, would, in such case, do themselvescredit by giving me the *coup de grace.*

* * * There are certain lines of trade in which a demand is always in existence without finding expression. Known requirements or needs are as good as imperative demands to a manufacturer. That inventor is the wisest whose invention is based upon known defects in present systems; and the progressive manufacturer is the one who keeps his eyes open to the needs as well as the wants of his customers. There are limits past which prudence dictates we should not go. We may be aware of the need but may find that a missionary bureau is required to apprise the public of its necessities. Such cases always connect themselves with inventions of a radical character. We see many things upon the market, meritricious within themselves, which purchasers never would have dreamed of asking for, but long-headed manufacturers, being aware of actual or easily made apparent needs, have entered into projects with an assurance based on good judgment, and have most always succeeded. A manufacturer will often spend years in trying to put some device of his own upon the market, when his judgment should tell him that his views are bound to be prejudiced, which could not be the case with the purchased invention of another.

* * * If a machinist has no more pride about him than to leave the shop and go home without washing or taking his over-alls off, how much pride can he have about his work? Sackett picks a man up every once in a while, as he starts home, and tells him there is water on tap in the wash-room. If a proprietor is smart, he will provide good washing facilities and will have them kept clean by a laborer. Some of these things are disgusting, and a man with decent tendencies finds himself compelled to furnish a bucket for his own individual use. If discipline is loose, these pails will gradually find their way all over the shop, and every man will wash where he chooses and throw his water over all the bright work in the neighborhood. It is not expecting too much of an owner that he should keep a decent

wash-room while he is keeping one. I question whether in all England one can find a shop with washing facilities in it, and it is rarely that men wash before leaving the shop. Such a plan may work over there, but in a republic, where the masses form the power of the land, the decency and intelligence of the masses must be provided for, and is worth ten thousand times what it costs. As a general rule, American workmen never go home before cleaning up, and foreign workmen never clean up before going home. A workman who is dirty and slouchy and down-at-the-heel all over as he leaves the shop, is the same while in the shop, and the stuff he sells for the price of labor is not generally extra super. The finest and cheapest work done in this country is done by high-priced men, who know a cuff from a collar, and the coarsest and most expensive work is done by men who have no soul above clothes which won't show dirt. I can take you into sections of the United States where the shops work full gangs of dirty men, and you will call the products of that section crude or rough, and you will find the work comparatively expensive. I can take you to sections where the hands are neat in appearance, where you can always distinguish between a workman and a blue post in the shop, and their work has astonished the world by its marvelous refinement of accuracy and unaccountable cheapness. If you will engrave the pictures, I will send you photographs of typical shops in these two sections, with the men massed in front, one crowd of eighty men, with six white shirts in the crowd, and one crowd of four hundred men and twenty dark shirts, and with the photos I can send the heaven-bond oaths of the shop owners that the men in either picture did'nt have their Sunday clothes on.

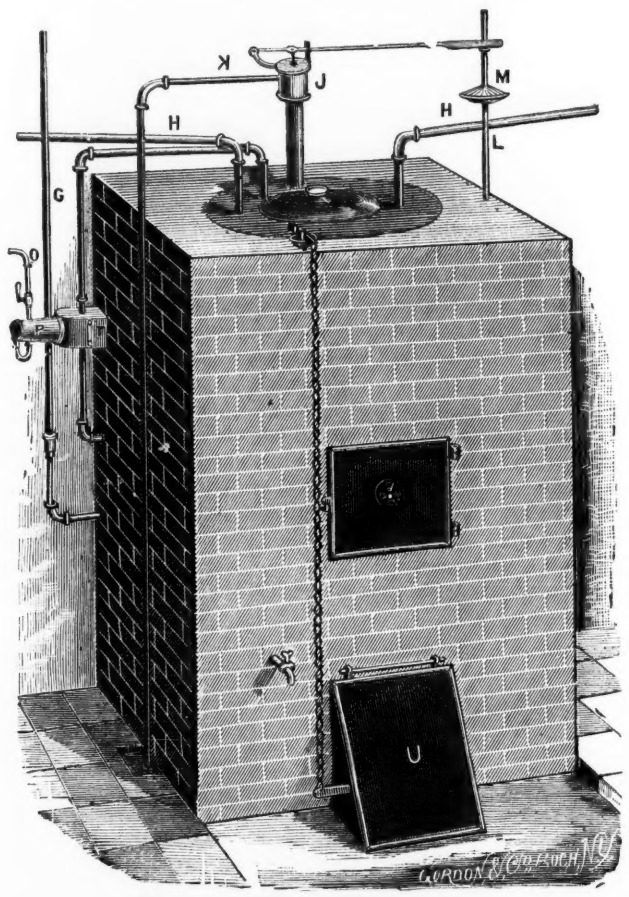
Very respectfully,

CHORDAL.

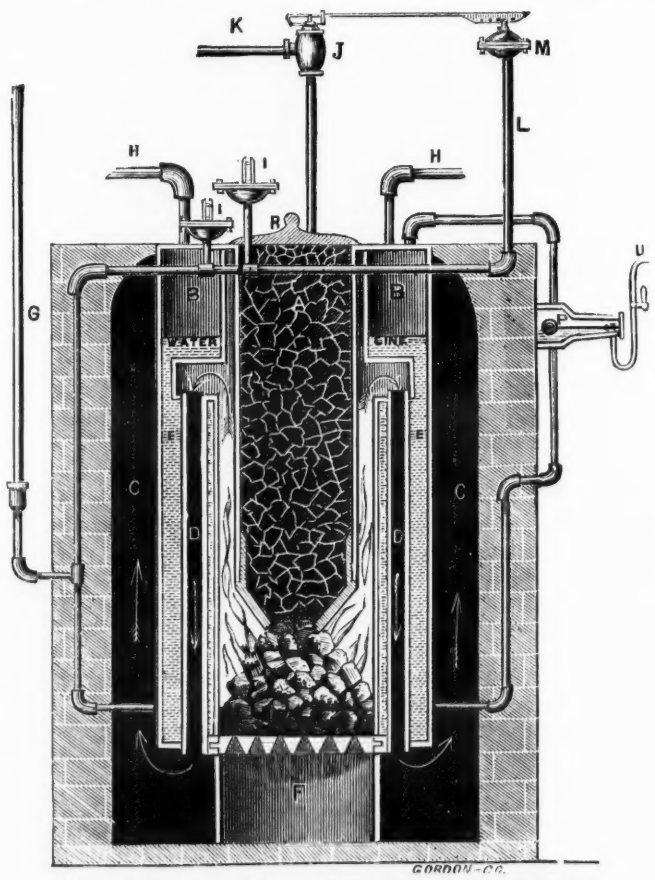
Dunning's Steam Heating Boiler.

Dunning's Patent Steam Heating Boiler, for heating private or public buildings, which is herewith illustrated, has but recently been introduced to the public, and is, therefore, as yet, but little known. Its merits are such, however, that within a few years it will undoubtedly come into very general use, supplanting many of the present styles of furnace heaters, as well as some steam heaters now in use. We do not propose to enter into an extensive argument to prove that the admission of a draft of dry hot air is in itself detrimental to health; that was long ago very generally conceded, and hot-air furnaces have been tolerated because they gave less trouble than many stoves. In manufacturing establishments having steam motors, in some hotels and public buildings, steam heat has been used for many years. But steam heating has found comparatively little favor in private dwellings; first, because the fire required frequent attention, which the hot-air furnace fire did not; and second, because many—especially the ladies—deemed a steam apparatus dangerous, unless it was constantly attended by an engineer.

The first object was always a good one until the invention of the Dunning Boiler, illustrated in the center columns of this page. With the ordinary steam heating boiler it is necessary to frequently replenish the fuel upon the fire, but the time occupied in the operation is the least loss involved. A greater is the loss of heat in opening the furnace door, and as great a loss as that is the heat which the new coal must absorb before it can ignite and give out heat. With each replenishment of fuel, for the time being, the steam runs down; if new fuel is not added at the proper time, the fire becomes low and no steam is generated. The steam in the pipes and radiators then condenses—becomes water—and they are filled with air. If the fire is brightened and new steam generated before it can become effective as a heating agent, the vents in all the radiators must be opened to allow the air and water to be expelled. This is a troublesome process. To obviate the difficulties, Mr. Dunning provides a reservoir in the center of the boiler, similar in form and in results to those used in base-burning coal stoves. This reservoir is large enough to contain coal for thirty-six hours, but it is better to fill it every morning or evening—once a day. All the heat lost in the frequent opening of the furnace door, necessary in an ordinary boiler, is in the Dunning boiler saved and applied to the making of steam. The heat which the coal must absorb before it can ignite is gradually taken up, and when the fuel reaches a point where the draft can effect it, it immediately takes fire. The coal in the reservoir cannot burn, because there is no draft through it. It can only take fire as it sinks below the outlet of the reservoir.



DUNNING'S STEAM HEATING BOILER.



HALF SECTION OF DUNNING'S STEAM HEATING BOILER.

All the heat is completely utilized, and less coal is burned for a given result than by the old system. No special skill is necessary for the management of the fire. Any person who can attend the ordinary base-burning parlor stove can attend the Dunning Steam Heating Boiler, as it requires no other care than to shake the grate, and to fill the reservoir once every day. An examination of the cut of half section will show that every part of the boiler is utilized. The heat passes through and around it, up along the fire-pot, as shown by flame, then down through the tubes or flues (D) to bottom of boiler, thence up the outside in space (C) between the shell of the boiler and the brick-work which encloses it, as shown by arrows, and through this space to the chimney. The tubes, some twenty-five in number, surround the fire pot passing through the water in the boiler. It is self-feeding—the water cannot fall below a prescribed limit, unless the supply is cut off, and if it falls below that line, an alarm is given. The largest fire the pot will hold could not raise the steam to a dangerous pressure, with a boiler full of water, and the safety valve may be arranged to blow off at as low a pressure as may be desired.

The Dunning Heating Boiler is no cast iron or cheap pipe contrivance, but a first-class boiler, made of the best flange iron, and capable of carrying steam for any and all purposes. Though it has been but recently introduced to the public it has been thoroughly tested in Mr. Dunning's residence for several years, and within the past two or three years it has been introduced into many private residences, into public buildings and manufacturing and mechanical establishments; and in his circular, Mr. D. gives a considerable list of names of well-known gentlemen who have them in use, and to whom he confidently refers.

Mr. Dunning makes five sizes of boilers, and can furnish, upon order, any size that may be desired. For further particulars, address Wm. B. Dunning, Geneva, N. Y., or Wyllis H. Warner, 114 Leonard St., New York City.

The Indicator Diagram not Defended.

Editor American Machinist:

I noticed in your issue of the 5th, a racy and disconnected communication, entitled the "Indicator Diagram Defended," by a party subscribing himself as "Mons. Yennepe," in which allusion is made to me; and, in reply, I beg leave to say, that I have always made it a point not to enter into a discussion with any one who appears under an assumed name, as I consider that, in such cases, one of two things is evident, either that the party knows his own weakness, or that he does not wish to be publicly recognized as the advocate or defender of a wrong. His denial of what occurred at the Mechanic's Fair in Boston is simply a voluntary assertion on his part, as I have evidence to the contrary in my possession, which was furnished me by some of the parties whose engines were on exhibition.

Now, if "Mons. Yennepe" will come out over his own signature, I guarantee to prove every statement made in my article on the "Indicator Diagram," that the diagrams were doctored; that "Mons." knew it; that he was not very far off when the little game was played, and, unless he does so, he will have to shoulder the responsibility of a number of assertions made in his communication which have no foundation in "fact." But it is not at all likely that he will do so, as doubtless, he is well aware that prudence is the better part of valor, and that it is far safer for him to attack an opponent in the rear, than to show his colors in front. The allusion to the Boston affair touched "Mons." on a tender chord, and he seemed more inclined to stave off a discussion by blank denials, than to let in the "light."

Now, unless he accepts the above *challenge*, we will consider him, in the beautiful language of the defender of the diagram, "fired out" for the present.

STEPHEN ROPER.

The remarkable metal known as wootz, or Indian steel, is now imitated with considerable success in some of the workshops of Europe, the process being as follows: Small pieces of very good forged iron or steel are put in a crucible and covered with charcoal; air is carefully excluded, and the mass exposed to heat until it turns dark gray—carburet of iron; this is easily pulverized, and in this state it is mixed with alumina and subjected for a long time to a white heat in a crucible, when it becomes white and brittle. If 1-6th to 1-12th of this white mixture is melted with some good steel, a very good imitation of Indian steel is said to be the result. Commercially speaking, the genuine raw steel, or wootz, comes in three forms, namely: in bullet-shaped pieces of a certain weight as they cool in the pots, and which comes from Calcutta; in cakes of two and a half pounds, from Bombay; and in cylindrical rods of about the same weight, from Golconda.

Pittsburgh, Pa., proposes to rid itself of the smoke from its manufactories by washing it. This is done by passing the smoke through the spray caused by paddle wheels revolving in a tank of water holding soda ash in solution. The tank and wheels are placed in the flue, between the furnace and the chimney, and, the wheels being made to revolve in the direction of the chimney, the draught is increased. The smoke, when thus treated, will not soil a white handkerchief.

Improved Stationary Slide Valve Engine.

The engine illustrated herewith is from the works of Struthers, Wells & Co., Warren, Pa., which firm has devoted great attention, during many years past, to producing engines capable of withstanding the hard usage and careless attention to which machinery is usually subjected in the oil and tanning regions of Pennsylvania, near which their works are located.

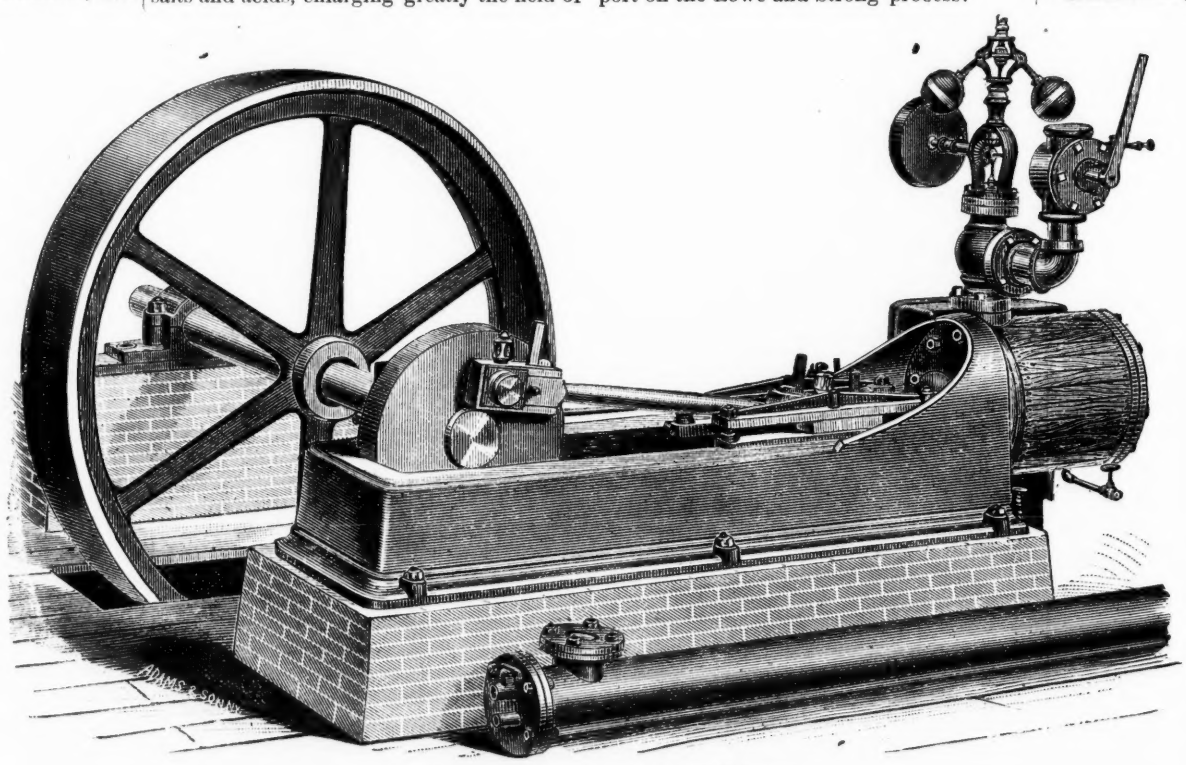
This firm make an important specialty of building steam engines for pumping and drilling purposes, notable points of excellence claimed being compactness, strength, simplicity of construction, neatness and easy running. It is also claimed in behalf of these engines that they are economical in the consumption of steam, and that the parts are easily accessible for repairs and attention, besides being made in duplicate and therefore interchangeable.

The engine shown in the illustration is made from nine inch bore of cylinder up to fourteen inch bore, and very heavily built throughout.

One notable peculiarity of this form of engine consists in the arrangement enabling a large increase of power by the process of removing the cylinder and substituting a larger cylinder, applying it on the end of the same bed. Under many circumstances, this is a very valuable feature, as such an alteration, effected at a moderate cost, may easily save what would otherwise be nearly the cost of a new engine. In such cases, the great strength with which these engines are constructed becomes an important factor in their value, by enabling them to withstand the increased strain thus liable to be brought to bear on them.

This firm claim that great care is taken in the selection of materials used by them, and the steadily growing popularity of their products would seem to fully support this claim. Their works are equipped with the latest and best machinists' tools and appliances that can aid in rapid production, or excellence of workmanship, and employ a force of 250 skilled workmen.

Messrs. Struthers, Wells & Co. also make a Patent Balance Slide Engine, designed more especially for drilling and pumping oil, salt and water wells, which we propose to notice in a future issue.



NEW STATIONARY SLIDE VALVE ENGINE.

Cheap Fuel and Light.

We have before us a report lately made by Gen. Herman Haupt, on several patents and processes for producing cheap hydrogen for light and fuel and utilizing it in a wide range of metallurgical operations. Gen. Haupt has made extensive investigations as to the working of these processes, and has prepared a valuable report, from which we make the following extracts, and will continue them in a future issue.

REPORT.

These patents embrace a very wide field, and the operations which they include may be divided into several classes.

1. Processes for the manufacture of illuminating gas.

2. Processes for the manufacture of a combustible gas for heating and culinary purposes.

3. Processes for the manufacture of cheap hydrogen, or combined hydrogen and carbonic oxide, for metallurgical purposes.

4. The use of hydrogen, carbonic oxide, carbonic acid, carbureted hydrogen gases, air, hydro-carbon vapors and super-heated steam, in various regulated proportions and combinations, for a wide range of metallurgical operations.

WHAT IS CLAIMED AS CAPABLE OF ACCOMPLISHMENT BY THESE PROCESSES.

1. The production of illuminating gas of superior uniformity, brilliancy and purity, at lower cost than by any other process, and not poisonous.

2. The production of a heating gas of uniform composition, possessing greater heating power, at a cost not exceeding that of the inferior gases produced by other processes.

3. By the application of gases and vapors as proposed it is claimed as results:

The deoxidation of ores of iron.

The production of sponge iron of great purity directly from the ores, which will not reoxidize in cooling.

The production of iron and steel of all the various grades directly from the ores, and of determinate and uniform composition.

The production of bar iron, steel, boiler and armor plates directly from the ores.

The hardening of the surfaces of iron manufactures to add to their durability and usefulness.

The softening or annealing of the surfaces of cast iron and steel manufactures, to increase their toughness and ability to resist percussive and other forces.

The treatment of manufactures of iron to give them a permanent property of resisting all corrosive influences, including that of salts and acids, enlarging greatly the field of specialties and opening up new manufactures.

The production of steel from ore or from crude cast iron without the use of spiegeleisen.

The removal of impurities and the preventing of oxidation in the processes of heating and forging masses of iron for the manufacture of shafting and other machinery, in the processes of re-heating and rolling iron and steel plates and bars, of annealing iron wire and tin plates, and manufacture of sheet iron with smooth and bright surfaces that will effectually resist corrosion.

The reduction of refractory and titanic ores.

The separation of impurities; the desulphurizing of ores of the precious metals, and the manufacture of superior iron and steel from inferior stock.

The attainment of all these objects by processes more economical than those now in use.

These claims cover a wide field. In reference to them I will observe:

First. As to the processes for the manufacture of illuminating gas.

These processes are very numerous at the present day. A large number of machines have been put upon the market which depend upon the use of gasoline vapor diluted with air. They are used extensively for suburban residences, and give satisfactory results.

A water gas produced by the decomposition of super-heated steam is now coming into very general use under the name of the Lowe gas. The process has been improved upon by Strong, of New York, who claims the ability to produce 1,000 cubic feet of gas from 50 lbs. of coal, at a cost of eight cents. This gas is not suitable for illuminating purposes, but by the use of naphtha, petroleum, or hydro carbon vapors it can be enriched at a cost, it is claimed, of 37 cents per 1,000 feet, and yields a gas said to be superior in candle power to ordinary coal gas.

The Gill process claims similar results, so far as concerns cost of production, but a gas of greater uniformity, brilliancy and heating power, consisting largely of hydrogen, while the principal constituent of ordinary water-gas is carbonic oxide.

To understand on what this claim is based a brief description of the process is necessary.

The Strong and Lowe gas is produced by passing super-heated steam through a furnace containing incandescent carbon, previously heated, by which means the steam is decomposed, the oxygen absorbed by the carbon forming carbonic oxide with some carbonic acid and hydrogen liberated, so that the resulting gas is a combination of which the following is said to be the average composition of one pound, as given in a printed report on the Lowe and Strong process:

Oxygen	.0174
Carbonic Acid	.0637
Nitrogen	.0880
Carbonic Oxide	.7097
Hydrogen	.0747
Marsh gas	.0465

The oxygen, carbonic acid and nitrogen have no heating or illuminating properties, and the carbonic oxide, of which there is 71 per cent., develops in combustion only 4325 units of heat per pound, while hydrogen, of which there is only 7½ per cent., yields 62,000 units per pound.

In this process, moreover, the temperature is constantly changing, the incandescent coal is gradually cooled so that its power to decompose steam is soon lost, and the operation must be suspended while the furnace is reheated.

The Strong gas requires for combustion 59 pounds of air, and develops 7727 available heat units per pound.

The steam coming in contact with 50 pounds of incandescent coal carries off a much larger proportion of sulphur and other impurities than if the quantity of coal were less.

In the Gill process for producing gas from the action of super-heated steam or incandescent coal, the production of gas is represented as continuous and not intermittent, and the product uniform instead of being variable. It differs from the Lowe and Strong in this, that the coal required to decompose the steam is contained in close fire clay retorts, heated from the exterior and not from the interior, and the heat maintained with uniformity. The steam comes in contact with not more than 20 pounds of coal or coke per 1,000 cubic feet of gas inside of the retort, and the fuel required outside is 25 pounds of coal. The total amount of coal, therefore, is less than in the Strong and Lowe process, but there should be no very material difference in the cost of the water gases for equal volumes. A pure water gas, produced from the decomposition of water and the complete combination of the liberated oxygen with the carbon, should consist, by weight, of 1 part hydrogen, 8 of oxygen, and 6 of carbon, these being the combining equivalents, and the resulting gas should contain 6.6 per cent. by weight of hydrogen which is nearly the per cent. given in the analysis of the Strong gas. The specific gravity by calculation is .912.

The specific gravity of hydrogen is .07, and the heat units developed in the combustion of one pound 62,000.

The specific gravity of carbonic oxide is .972, and the heat units developed in the combustion of one pound = 4325.

But, .07x62000 = 4340 units,

And .972x4325 = 420 3

So with equal volumes the heat units are nearly equal under equal pressure.

It is necessary to distinguish between quantity and intensity of heat, and I was surprised to find so much confusion of ideas and diversity of opinion amongst practical metallurgists and scientists on these subjects, and especially in reference to the temperature of furnaces. Mr. Gill claims to have discovered the errors of the usual theoretical formulas for temperature, which give carbonic oxide an intensity in combustion of over 5000°, and hydrogen of only 4000°. The absurdity of this result is apparent from the fact enunciated by Bunsen, that carbonic acid is dissociated or resolved into its elements at from 1832° to 2192°, and consequently at or above this temperature carbonic oxide cannot undergo combustion at all, which consists in conversion into carbonic acid. Vapor of water is also said to be dissociated at 4532°, which is the highest temperature from combustion of hydrogen, and the highest possible in a furnace.

Further, the average heat of a furnace must be less than the maximum heat of combustion of the gases, for all the heat communicated to the substances acted upon must be deducted from the source of heat, the combustion of the gases. The temperature of combustion given by writers is purely theoretical, and would appear to be erroneous.

Mr. Gill claims to have demonstrated, not only theoretically, but practically, that the intensity of combustion of hydrogen is much higher than that of carbonic oxide, and has deduced formulas which give results consistent with experiment and observation, and which he proposes at a proper time to publish.

I will only add that I am unable to perceive any flaw in the reasonings and conclusions of Mr. Gill, who impresses me as a thorough expert on the subject of temperatures.

Admitting that the same quantity of heat may be developed by the combustion of equal volumes of carbonic oxide and hydrogen under equal pressures, it must be observed that a gas consisting chiefly of carbonic oxide is poisonous and too dangerous for domestic purposes, while for metallurgical purposes the intensity of combustion and the affinity of hydrogen for sulphur and the phosphorus as well as for oxygen render it a more useful fuel than carbon or oxides.

The Gill process it is claimed permits the gas to be generated under considerable press-

ure, so that a given volume may develop a much larger number of units of heat in combustion and also greater intensity than at ordinary pressures.

The New Musical Steam Whistle.

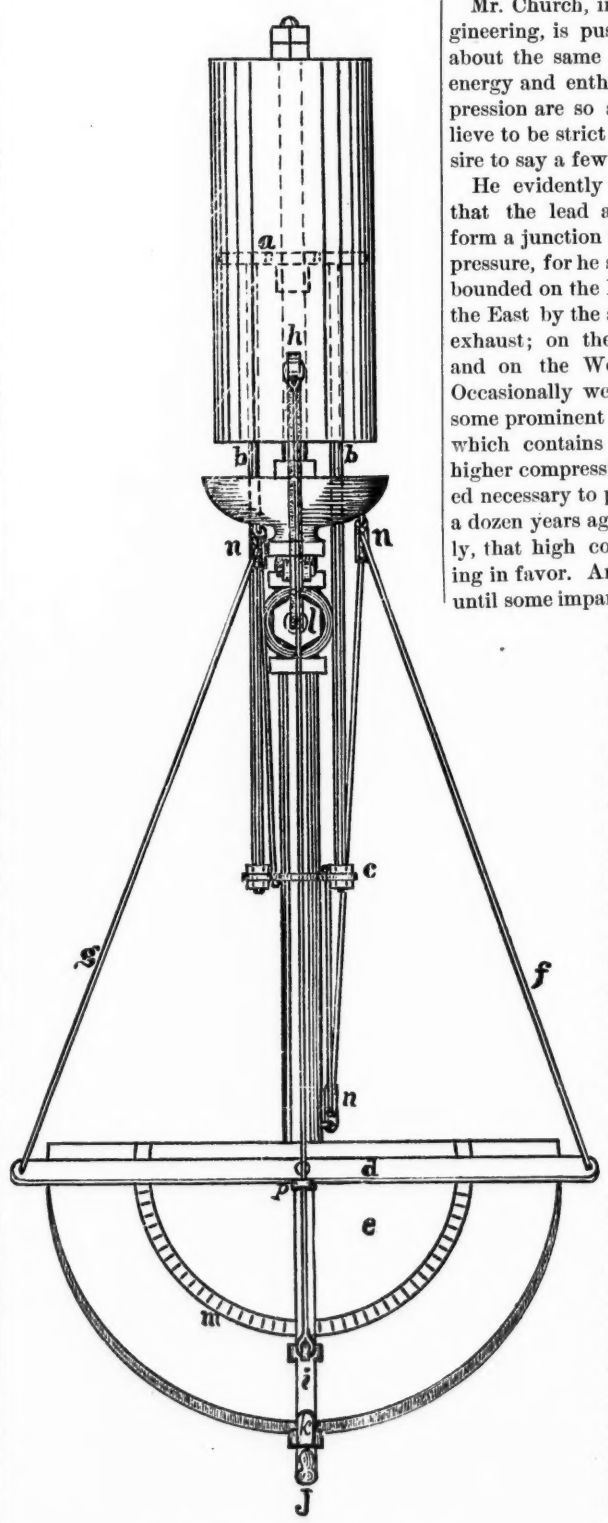
BY L. F. LYNE, M. E.

The people living in New York and vicinity have, for some weeks past, been very much agitated in consequence of a noise like an unearthly screech, and followed, almost directly, by the playing of one or more tunes. There has been great speculation as to the cause of these eruptions of sound, and, for illustration, we will mention one incident. A prayer meeting was being held in a church in the upper part of Jersey City, and, as the meeting progressed, the tune of "Grandfather's Clock," or some kindred tune, burst forth from this strange instrument, as if just at the door of the building. The congregation looked at one another, and their attention became so diverted that the pastor called the sexton and requested him to retire and use the proper means to stop the playing of that musical instrument in front of the church, as it disturbed their meeting. It is needless to add that the sexton found nothing in front of the building, or anywhere in the vicinity, that could be the means of producing the noise. Others more inquisitive, and determined to find the source from whence the noise proceeded, followed the direction of the sound, thinking that at the turning of each corner it would bring them in sight of the mysterious object, which had, by this time, grown, in their imagination, to the proportions of a behemoth or the perennial sea-serpent. But in this they were also disappointed, until, at last, they arrived at a pier on the river front, where they saw a steam tug near the middle of the river, from which the sounds proceeded.

Having traced these mysterious sounds to the source from whence they came, I will now endeavor to describe this strange nondescript and the manner in which the sounds are produced. The illustration represents an ordinary steam whistle constructed after the usual pattern, with this exception: that the top part, commonly called the bell, is longer than those generally used. A disc is fitted inside the bell, so as to move freely up and down, and is represented by the dotted line at *a*. Attached to this disc are two ⅝-inch rods, *b*, *b*, which pass down through the bottom part or bowl of the whistle, and are connected to a cross-bar, *c*, which encircles the steam pipe. The reader will observe two stout cords, *f* and *g*, the lower ends of which are attached to the arms of the T-shaped handle, *d*; the cord *g* passes through one of the small pulleys, *n*, thence downward the end being fastened to the cross-bar, *c*, while the cord *f* passes over the other pulley, *n*, on the opposite side, thence downward through the lower pulley, *n*, then up and fastened to the cross-bar, *c*. The handle, *d*, is pivoted at the junction of the arms, to the board, *e*. To the lower end of this handle is attached another handle at *j* at right angles with *d*. Directly under the whistle is a common whistle valve, *l*; to the handle, *h*, a cord is attached, which passes down through a guide, *p*, and the end attached to the handle, *k*, which slides upon the part on the end of which the handle *j* is located.

From the foregoing description it will be observed that, by moving the handle *j* alternately from one side to the other of the board *e*, the disc *a* will necessarily be raised and lowered by the shortening or lengthening of the cords *f* and *g*. To prevent resistance in moving the disc *a*, in consequence of the compression of air, or the formation of a vacuum within the bell, two small holes are bored through the disc. The higher the disc is raised the lower will be the sound produced, and *vice versa*. Upon the board *e* will be noticed a graduated arc, *m*, which answers as a keyboard, and each division is to be marked with a letter or number. By moving the handle *j* to the extreme side of the board, which brings the disc *a* near the top of the bell, with the same hand depressing the handle *k* (which will admit steam to the whistle), and moving the same to the opposite extreme of the board, then back, the "unearthly screech" is produced. But, by adjusting these handles so as to coincide with the marks on the graduated arc, harmony can be produced, and, by a little practice, tunes may be played, as we have seen demonstrated.

As to its practical utility, the inventor proposes to use it on vessels as a sort of telegraph, using certain sounds to represent words; also to utilize it in the fire departments of our cities, as the bugle is used in the army to convey commands and instructions. It is also claimed to be adapted to railroads as a means by which the train men may be warned of the danger of a collision



NEW MUSICAL STEAM WHISTLE.

by the ever-watchful engineer, while it may be used on factories or plantations to call the different hands, or foremen of the same.

Finally, it may be used as a musical whistle upon which to play tunes, as it possesses the capacity of the Calliope combined in one whistle. The inventor intends to have musical scales, applicable to this whistle, so arranged that a child will be able to play tunes upon it, as notes will be wholly abandoned, and letters or numbers substituted.

This whistle was invented by Frederick Wood, a foreman in the New York, Lake Erie & Western Railroad machine shops, Jersey City, N. J.

The steam motors on the Third Avenue Railroad in this city are working well.

Steam Compression and Expansion.

Editor American Machinist:

In an article on "The Influence of the Distribution of Steam on the Efficiency of Steam Engines," by M. Marcel Desprez, and translated by Prof. R. H. Thurston, for the *Railroad Gazette*, the author says: "Not only is compression not harmful, but, more than that, it is indispensable to attain the maximum economical efficiency;" and again, "When, in an engine with complete expansion, the compression is so adjusted as to bring the pressure of the steam up to that of the steam in the boiler again, at the commencement of the steam lead, the efficiency of such a machine is the same as that of a perfect engine, having neither steam lead nor dead spaces."

Mr. Church, in his articles on Steam Engineering, is pushing a line of argument in about the same direction, with considerable energy and enthusiasm. His ideas of compression are so at variance with what I believe to be strict engine economy, that I desire to say a few words in reply.

He evidently believes, with M. Desprez, that the lead and compression lines must form a junction near, or at, the line of boiler pressure, for he says: "The perfect card is bounded on the North by boiler pressure; on the East by the adiabatic curve and perfect exhaust; on the South by the atmosphere, and on the West by *initial compression*." Occasionally we see a trade circular from some prominent and popular engine builder which contains indicator cards, showing a higher compression curve than was considered necessary to produce the best results half a dozen years ago, showing, very conclusively, that high compression is steadily growing in favor. And it will probably continue, until some impartial and carefully conducted test proves that it can be productive of no good beyond that of cushion. The theory and practice of compression, when used to plug the dead spaces in an engine, are in such direct opposition to the advantages claimed for short stroke engines with quick rotative speed, that I am surprised to see Mr. Church cling to it so tenaciously. In all cases compression reduces the capacity of the engine in just the ratio the space enclosed within the compression curve, air line and vertical line drawn at the end of the diagram, bears to the effective area of card, which means, in engines with large clearance and high compression, a serious loss of power, which can only be restored by a later cut-off and higher terminal pressure. Nor can there be a single unit of heat "squeezed" from the exhaust steam without rendering an equivalent in the way of higher steam pressure on the opposite side of the piston, which, neglecting the friction of engine while passing the centers under compression, will just balance. But if we take note of the extra friction due to the unnecessary resistance, then there clearly is a draft made upon the momentum of the fly-wheel, which must be paid back again with the "strictest honesty," in the way of later cut-off in cylinder.

Mr. Church very aptly puts the question when he says, Compression is a spring which pays back all it absorbs; but does it return any more? It must; else there can be no advantage beyond that of cushion, which does not enter into the economy of a steam engine. Mr. Church tells us, substantially, that if the exhaust steam be all expelled from the cylinder, on the return stroke of piston, then will the cooler walls absorb heat from the entering steam from boiler, and entail a loss in the way of condensation; and again: "The cylinder-walls abstract some of the heat during compression, thus causing the pressure to fall short, and to determine the actual point of closure we must fall back on the diagram."

Is not that an unconscious admission that cooler iron will abstract heat from steam of like temperature, whether it be raised by compression or a fire under the boiler? The earlier point of exhaust closure, of which Mr. Church speaks, is the correct measure of heat absorbed during compression. I think a close examination will show that the walls of dead spaces and cylinders absorb no more heat, from the entering live steam, than is given out during compression to the same temperature.

The mean distance between the air and exhaust lines, multiplied by the scale of indicator, is a correct measure of the power required for the expulsion and compression of steam, which does not enter into the effective force exerted by the engine; this is certainly an expenditure for which the driving belt gives no receipt. Now, since the walls of the cylinder abstract heat from steam compressed to initial pressure, just the same as from steam supplied by the boiler, would it not be better to transfer the record of wasted energy, which lies below the air line, to the effective area of the diagram above, and thus add to the capacity of the engine?

Chordal, in one of his letters, tells of a smart engine firm who advertise to relieve their pistons of weight by putting a spring in the lower half of piston-head. Are they any farther astray than the engine builders, who run compression to the top of the diagram and talk about saving the exhaust steam?

There is no natural law greater than that of compensation. Every stroke of the engine proves it by paying out in the way of radiation, condensation and power supplied to plant, just exactly what it receives from the heat entering the cylinder. It neither gives more nor less. Gary's neutral line startled half the electric world, but a sober second thought convinced all that it was only a new dress for the old story,—an attempt to get something from nothing. Are not these high compressionists striving a little in the same direction?

There are undoubtedly cases where heavy compression may be productive of economy: for instance—an engine may be so much too heavy for its duty that the cut-off will take place so early in the stroke that the expansion line will run way below the air line, thus compelling the piston to make the last part of its stroke in opposition to a partial vacuum. In such a case, as soon as the exhaust valve opens, the greater pressure of the atmosphere fills the cylinder with the vapor and air in the exhaust pipe, and reduces the temperature way below that of an engine which releases its steam at, or about, the air line. In such a case, if a smaller engine cannot be got, compression may be made a factor of economy. I have a card in my possession showing just such conditions, which I will some day submit if your patience endures.

H. T.

Corning, N. Y., July 8th, 1879.

The Holly system steam heating is to be adopted in Dubuque, Iowa. The company will be known as the Dubuque Steam Supply Company; capital stock, $25,000.

An agent sent from Cleveland, O., to Rio Janeiro, Brazil, last summer, has built up a fine trade in Cleveland-made goods, and is doing much better than his most sanguine friends anticipated. He has recently sent an order for a number of tons of horse-shoe nails, while he is selling a large amount of screws and steam gauges.

Henry Bessemer, the English inventor, has taken out 160 patents, almost as many as Edison, and one of them—his process for making steel, ranks as one of the most brilliant inventions of the century. It converts pig-iron into steel in a few minutes, and has reduced the price of steel rails per ton from $200 to $30. Ten times as much steel is used in the world now as was used prior to 1856.

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☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

NEW YORK, JULY 26, 1879.

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For the general information of the machinery trade, our readers are invited to advise us by letter or postal card, of the probable erection of any buildings in which steam engines, or important machinery of any kind are likely to be required.

The July Stock-Taking.

About this time most of our large shops have gone through their semi-annual "taking stock," and have launched out upon the business of the last half year with firm resolutions to make a better balance sheet after the stock-taking next January. Viewed in the light of the last two years' business progress, it is probable that most fairly conducted shops can make a more satisfactory showing than in 1878; yet an increasing trade does not necessarily carry with it an enlarged margin of profit. The goods manufactured must be sold and the money obtained for them in order to exhibit an undoubted profit. Credits are usually well scrutinized, and risks that would have been readily taken a few years ago are now passed by; but the productions of many shops are difficult to sell, not because they are badly designed or unskillfully fabricated, nor that business is quiet, but because the demand for such productions is too limited to keep a shop running regularly to supply them. It is safer to manufacture something for which there is a demand, than to expend time, talent, and money in trying to create a demand. Not a few machine shops have foundered by building novel and ingenious tools and machinery on an extended scale, in the confident anticipation that they could educate the public into using them. When the time comes for taking account of stock, most of these ingenious and perhaps highly useful tools are obliged to be marked down as still on hand. This is, of course, discouraging; but it is better to rectify the mistake at the first stock-taking period than to go on manufacturing, trusting that the educating process will be more rapid, as the public become better acquainted with the peculiar excellencies of the special production. We can recall a number of instances where complete and costly shop outfits have been purchased to manufacture tools and machines such a had been but little in use, or not at all, and persistent efforts made to develop a market for them with the most disappointing results. Therefore we contend that if a shop is building machines or appliances that don't sell, it is best to make a change, and turn out something that will sell while it has means left to make a new departure.

The semi-annual stock-taking may bring out prominently the unpleasant fact that tools for which a good steady market has existed are no longer selling to advantage. When this is the case, it becomes the manufacturer to inquire whether his wares are up to the standard required. Not infrequently a concern gets behind the times by neglecting to study improvements in the articles made for sale, until they are crowded out of the trade by more enterprising establishments.

Stock-taking, and reckoning of gains or losses, may indicate leakage somewhere in the business, though not point it out specifically. The coal bill may be rather large, in spite of low prices for this commodity, but it requires some investigation to determine the cause. The boiler should be looked over carefully every few weeks, or it may get to swelling the expense account in an unbecoming and aggravating manner. When a thick scale is allowed to form inside, and the tubes choke up with the products of combustion, an undesired effect is sure to be produced upon the cash balance so long as these conditions are maintained. If the boiler is all right, the engine may be allowing the dynamic power to go to waste in an arithmetical progression. It needs watching in most cases. There are many manufacturing towns in which enough value is wasted in fuel by old, poorly built and badly managed engines to bountifully sustain several charitable institutions. It don't take long for a leakage of this kind to amount to the price of a new engine. This is a good time to overhaul the small tool account. Many shops keep such an indefinite record of the cost of taps, dies, reamers, drills, screw plates, files, wrenches, and the like, that their whole cost can scarcely ever be ascertained. Serious leakage will often occur in the tool department unless a careful record is kept. Now, just after the July stock-taking, is a favorable time to open such a record where one does not already exist. The tool account should be made to show the actual value of tools on hand and in working order. In some shops the first cost of tools is alone considered, and a lot of broken and worn out working materials is counted in at the stock-taking for their original value. It is also worth the time and attention to examine accounts for oil, for repairs, for "entertaining customers," for making alterations to correct mistakes, and for various other things that are sometimes chargeable with leakage. The account for traveling salesmen may be rather large, but if it be materially reduced the schedule of "stock on hand" may swell to unexpected proportions by the January marking up of the business. It necessarily costs something to sell goods as well as to produce them, and without the former the latter might as well be discontinued. Then there is the important account for the pay of workmen. All the other sources of expenditure should be thoroughly reviewed, and every dollar saved that can consistently be figured away from running expenses, before the pruning knife is applied to workmen's wages. We commend these suggestions to machine shop owners who desire to exhibit a good balance sheet at the end of the year.

Getting Rid of Steam.

Every few days we come upon a startling announcement (usually in the shape of a letter from the inventor to the editors of our favorite morning paper, duly published in the correspondence column) of some newly discovered and wonderful force, which is warranted to supersede steam, and so, by doing away with all the costly machinery now in use, to work an entire change in the world's business.

So startling is this announcement at times, that the reader feels that the editors are becoming too amiable to be prosperous, and that he is getting altogether too much news for his money.

Sometimes, indeed (though we are always pleased to see our machinery friends), the busy quiet of the editorial presence, even, is invaded by the inventor, or by some self-authorized plenipotentiary, until we feel like exclaiming with the poet,

"Can such things be,
And overcome us like a winter rainbow?"

or words to that effect. Extreme cases have occurred in which our amazement, our surprise, has even prevented us from ascertaining the constituent parts of which this mysterious force was composed, to the lasting injury of science and mechanical progress, for the reason that usually nothing is heard of it ever after. But whether the new force is made up of equal parts of cold steam and warm air, or nitro-glycerine and bottled lager, is a problem not to be rashly attempted, much less solved.

In an age when real inventors of the very first order, like Corliss, or Wright, or Worthington, think themselves lucky if years of diligent study and hard work shall enable them to perfect and bring into general use some single appliance connected with the steam engine, such as a valve or cut-off, can we ever sufficiently appreciate the geniuses who evolve such radical discoveries from the depths of no work and less study? Rather let us strive to be truly thankful, that we were not born away back in the dim ages, when it took Tubal Cain fifty years to fashion a shoe-buckle or a pruning hook.

We are in receipt of a postal card bearing date, Brazil, Tenn., July 6, as follows: "Gentlemen—Please send me a specimen copy of the AMERICAN MACHINIST," and here our friend forgot to append his signature, leaving us in a fog as to the address of the writer. We don't suppose there is any psychological method by which the postmaster can separate our friend from the other Brazilians, so we shall be compelled to refer him to the nearest local newsdealer.

The Prison Contract Iniquity Again.

A special meeting of the Brooklyn Board of Supervisors has been called for Monday next at 10 a m. The object of the meeting is to ratify the contract of the Bay State Shoe and Leather Company for the employment of convicts of the Penitentiary.—*Brooklyn Daily Times.*

We commented recently upon the infamous prison contract system in vogue in nearly all the States and large cities throughout the Union, as illustrated by the above newspaper extract.

The great injustice of the system does not consist in the especial fact that 100 or 900 convicts, farmed out at 40 cents a day, are put to work in any particular branch of manufacture, but in this—that for every such number so engaged, 1,000 or 9,000 honest workmen, as the case may be, have to be ground down to starvation wages, in the vain effort to compete with manufacturers who enjoy these profitable prison contracts.

It is not the goods that the prison contractors *actually sell*, but the prices they offer and compel other manufacturers and dealers to sell at, that cause the trouble.

Take any article made under the prison contract system. The prison contractors may be able to make only a small part of the quantity annually consumed, but their prices are scattered broadcast, and Brown, and Jones, and Smith, and a hundred other manufacturers employing honest workmen must choose between meeting those prices or shutting up shop, and letting their factories and machinery tumble to pieces about their ears. As a result, the tens of thousands of men employed by them are screwed down to as near nothing a day as operatives can exist on, and still the manufacturers lose money.

And of course, the traders in every branch of business, who depend upon these people and their families for patronage, find business bad, and so the trouble extends, until it results in a monopoly of the market for a few favored prison contract manufacturers, and a lessened ability to buy these and all other goods upon the part of everybody else.

The evil effects of the system reach even the prairie farmers of the West, for how can farmers hope to find a decent market for their wheat and corn, when hundreds of thousands of skilled workmen everywhere are having their noses held down to the grindstone of want and starvation wages, by competition with felon labor working at 40 cents a day?

It is notorious, that in many branches of manufacture, the convicts have already practically driven ten, yes, twenty times their number of honest workers from the field. Naturally, of the latter, some of the weaker-principled, rendered desperate by inability to provide a decent living for their wives and children, either fall into crime, and become convicts, to be farmed out in their turn at 40 cents a day, or degenerate into tramps and quit honest work altogether. In too many cases their sons grow up to be vagrants, and their wives or daughters, deprived by the operation of unjust laws of their natural protector and bread-winner, become—well, it is not necessary to carry the illustration further.

Now, it is entirely proper and right to teach prisoners some substantial trade or calling for use in after life, and to make their labor benefit the State by rendering the prisons as nearly self-supporting as possible. But it is infamous to make the prisons of the State a curse to the State and nation at large, and to make them *self-filling*, in the effort to make them self-supporting.

We hear a great deal said in certain quarters about Chinese labor, but the Mongolian trouble is trifling, compared with this 40 cent felon competition in every State and city.

Workingmen and legislators, vote and act so as to set a hundred thousand convicts at work in thirty eight states to ruin a hundred different branches of industry, and you have taken a long step towards inaugurating a chronic condition of *hard times* throughout the length and breadth of even this great country.

Extraordinary Success of American Locomotives Abroad.

According to the latest information, the American locomotives sent to Peru, Australia and Mexico, have given perfect satisfaction, and small orders are almost constantly forwarded. The greatest obstacle that the American engine has had to contend with in these countries has been the jealousy and prejudice of the railroad officials, most of whom were Englishmen. We know of an instance where an American locomotive was placed upon a foreign railroad on trial with some of the English engines, and notwithstanding the prejudices and neglect of this engine, the results shown in the economical workings were astounding. After a short time, the master mechanic, who, by the way, was an Englishman, was asked for a report of the results, which was given directly and truthfully, being in favor of the American engines. The result was that the master mechanic's head was cut off immediately, or, in other words, he was discharged as a man who was working against the interests of the company. This shows the odds that American engines have to contend with; yet they have beaten the English engines in fuel-economy two pounds and one-tenth per train mile, and after some experimenting and alterations, two pounds were saved. Taking the first cost of the English engines at £2,352 to £3,032, and the American at £2,132 it would seem that we have a decided advantage, but notwithstanding all this, there has been the most severe and bitter competition. However, we believe that the British Government is looking at these things in a liberal way, drawing our inferences from an extraordinary admission which appeared in a leading English journal, after this wise: "When we hear of Americans taking contracts for locomotives at prices which English makers are compelled to decline, it is manifestly not a question of the cost of the raw material, or they would be underselling us in pig-iron and rails, rather than in manufactures of the highest quality. The truth seems to be that the article supplied is better adapted to the wants of the buyer." Englishmen are very peculiar, or rather have been (for it appears that they are overcoming their prejudices), in concluding that what suits them in their own country is adapted to all others. An American goes for business, and will make anything anyhow and for anybody and according to the customer's ideas and specifications, while the Englishman adheres obstinately to his old patterns. In the manufacture of machinists' tools, such as lathes, planers, etc., our English cousins put nearly double the amount of material into them that we do. This objection can be passed over to some extent in tools, but when applied to locomotives, "never!" The English have already admitted that we far surpass them in the lightness and finish of machinery manufactured in this country. The success of American enterprise is owing to the fact that we carefully study the wants of our customers, for by so doing the transactions are mutually beneficial; our patrons are pleased, and when further supplies are required they are sure to come again. In our possession are copies of numerous letters from Mexico, Peru, Australia, and other countries, all acknowledging the superiority in every respect of American engines, and the time has now come when the "Child can lead the Mother."

One of our Western subscribers in sending a renewal of his subscription for one year, writes: "I like the paper very much and hope for its continuance. It is truly an advocate of the progress of American machinists, a trade I have followed the past 37 years, and am not too old to learn something yet, from the manufacture of cotton and woolen machinery and locomotives down to the manufacture of watch machinery and watches, in which I am now engaged, and have been for the past 15 years."

The above is a sample of many letters which we are constantly receiving. They come from a class of machinists who read and make progress in their business, and are thereby enabled to command without difficulty the best positions and the best wages, or to successfully manage shops of their own. These present a great contrast to the mechanics who are content to know just enough to carry them along by hook and crook, and consider it folly to spend time in reading books or live mechanical newspapers.

In giving a list of tap and die manufacturers in our July 12th issue, we inadvertently omitted the name of Charles Elterich, New York City, which should have appeared in that list. Though one of the latest to engage in the business, Mr. Elterich has secured an excellent reputation for his productions. Frasse & Co., 62 Chatham St., are sole agents for their sale.

It is related that, a few weeks ago, while a certain manufacturer was having a new boiler set in brick work, he took occasion to ask the solitary workman, "How long will it be before you get this boiler-setting done?" "Well, I don't know," said he, "the boss has just gone to look for another job; if he gets it, I'll be done to-morrow, but if he don't, I'm afraid it'll take me all next week."

Love Me, Love my Dog.

In these improved modern days when so many daughters are being trained to regard household tasks, and the personal care of children as menial and degrading, and to believe that the possession of lily-white hands and a poodle are requisites—lacking which, a woman can in no wise be called a lady, it is really touching to record such an illustration of wifely devotion (if not survival of the fittest), as comes to us all the way from Lake Minnetonka, Minn., the scene of a recent terrible boiler explosion.

"At the time of the disaster, Mr. S. E. Tate (who was instrumental in saving several lives) was fishing near by, and hastened at once to the scene of the explosion. All of the steamer, except a small portion of the stern, had been blown to atoms. The roof above this had been driven down, and his search among the ruins resulted in his finding in this place a lady. He succeeded in getting her extricated from the wreck and safe into his boat.

"Her first ejaculation upon being rescued, says Mr. Tate, was, 'Oh, my poor dog! See if you can't find him?'

"Mr. Tate had other business to attend to just at that time, and so informed her, but at her earnest solicitation looked about for that dog, but without success. Imagine his surprise when a minute later the lady (whose solicitude for the dog's welfare had led him to imagine that the canine was the only living or dead thing in the vicinity that she had an interest in) pointed to a gentleman, who, half in the water and half out, was clinging beside the engineer to a large piece of the wreck that was floating in the vicinity, and screamed out, 'Oh, my poor husband!' It really was her husband. He was but little injured (this immaterial information being thrown in parenthetically), but, alas! alas! a few minutes after they reached the shore, the poor little doggie's corpse arose to the surface. And there is one woe-begone woman in the land who will not be comforted."

Now, it would seem that some plan should be devised to encourage the boiler exploders of the period to operate more scientifically and humanely than appeared to be the case in the *May Queen* disaster. Had the "Engineer," just about the time he discovered that the whole machine was getting hot enough and dry enough to explode quickly and comfortably, only been thoughtful enough to have gone about the boat ringing a large bell, or to have adopted some other sufficient means of giving reasonable warning, enabling the ladies on board to equip their darling doggies nicely with floats and life-preserving jackets, there is little room for doubt that several precious woolly pets might have been saved to ornament many a brilliant street promenade.

But such is the vanity of life—in fact, death always did love a shining mark!

As for the husbands—there's no sort of occasion to worry over saving *them*—husbands are plenty enough.

A Correction.

One of our Philadelphia readers writes under date July 12, 1879, as follows:

"In your paper for this date is an article headed 'Another Triumph of American Genius.' After inspecting the tap, which must be a master piece of work, you are led to exclaim 'Where is the rule with which to measure American enterprise?'

You answer by saying, 'and echo answers where.' Echo would not give such an answer, but would give you a correct one, which would be *enterprise*. Am I not correct?

"Yours respectfully, C. C."

[Yes, enterprise is the word. Now send us particulars of the latest and best specimen of it, belonging to our specialty, that has come under your notice.—ED.]

A recent issue of a prominent scientific publication devoted the greater part of two columns of its valuable space to a detailed description of a wonderful piece of carved work (in the shape of certain miniature wooden buildings) recently completed by one Bergmann, after years of labor.

What scientific or other good end is to be promoted by such particular notice, aid and comfort, our contemporary forgot to state, and we have not the presumption to inquire.

Now, base-ball has its uses; the practice of canoeing across the open ocean may yet add something to the science of navigation; the walking mania, at present so widely in vogue, tends to strengthen the legs of its numerous amateur votaries; and even the present political methods of the day result occasionally in electing a moderately honest man to office.

But what good object, other than a slight incidental benefit to the jack-knife trade, can be served by encouraging other ingenious men (who might spend their skill and patience in so many higher and nobler uses) to fritter away years of labor in this fashion, is one of those enigmas, which some equally patient genius will yet, perhaps, make plain to us.

We have lately received calls at our new office from the following out-of-town gentlemen prominently connected with the machinery interest:

L Sharpe, Treas. Brown & Sharpe M'f'g. Co., Providence, R I.

William Wright, Newburgh, N. Y.

A. F. Upton, Manager Jarvis Furnace, Co., Boston.

J. M. Carpenter, Pawtucket, R. I.

Harris Taber, Supt. B. W. Payne & Son, Corning, N. Y.

Mr. Nutt, Danbury, Conn.

Mr. Hendey, Supt. Hendey Machine Co., Wolcottville, Conn.

John A. Walker, Secy. Dixon Crucible Co., Jersey City, N. J.

W. H. Tolhurst, Troy, N. Y.

V. S. Wood, Washington, D. C.

T. R. Pickering & Co., Portland, Conn.

Alex. Saunders, of D. Saunders' Sons, Yonkers, N. Y.

Situations Wanted—Help Wanted.

Hoping to add materially to the usefulness of the AMERICAN MACHINIST, both to employers and employed, in the occupations represented by it, we have determined, beginning with our next issue, to receive and publish notices suitable for the above headings, and not exceeding four lines each, at the nominal rate of *twenty-five cents* for each insertion. Workmen wishing situations, or employers desiring to advertise for help in any of the machinery trades can here make their wishes known.

About eight words make a line, and all notices in excess of four lines will be charged for at the rate of twenty cents per line.

Owing to the the pressure on our columns this week, we are compelled to omit "Steam Engineering," Part II, by Chas. J. Hague, and an article (with diagrams) on Remodeling Valve Motions.

Compliments of the Press.

Again we have to express sincere thanks to our contemporaries for their favors in noticing the change of the AMERICAN MACHINIST from monthly to weekly. Our crowded space this week permits copying but a very few of them, but we assure our editorial friends that every one of their kind notices is duly appreciated.

(*From the Brooklyn Times.*)

The AMERICAN MACHINIST, a trade journal of considerable merit which has now been in existence for nearly two years, has ceased to be a monthly publication, and henceforth will make its appearance as a weekly. The MACHINIST is a sixteen-page publication, having some forty columns of original and interesting reading matter for machinists, engineers, founders, boiler-makers, blacksmiths and others. Every number is finely illustrated, and in the current number appear articles upon all manner of mechanical subjects. The editorial management of the journal is quiet, fearless, and, taken altogether, it is a very readable one in all of its departments. The MACHINIST is published by the American Machinist Publishing Company at 96 Fulton street, New York, of which Mr. Davis Strong, a son of the Hon. Demas Strong, is the Secretary.

(*From the New Castle (Pa.) Courant.*)

The AMERICAN MACHINIST has been changed from a monthly to a weekly. It aims to be the standard machinery paper in this country. It publishes no paid notices under the guise of editorials, so its readers may always be sure of getting the editor's own opinions and not those of an interested party. $3.00 per year. 96 Fulton street, New York.

(*From the National Car-Builder.*)

The AMERICAN MACHINIST will hereafter be published weekly instead of monthly as heretofore. It is an excellent mechanical journal, and we are glad to notice this evidence of its prosperity. In consequence of the change, the subscription price has been advanced to $3 per year. Published by the American Machinist Publishing Co., 96 Fulton Street, New York.

(*From the Newburgh Daily Register.*)

The current number of the AMERICAN MACHINIST—which is publishing a series of articles entitled "Our American Mechanical Engineers"—contains a biographical sketch of William Wright, of Newburgh, and a picture of the gentleman. The sketch we copy in another column.

(*From the Detroit Evening News.*)

With the number of June 28th, the AMERICAN MACHINIST, New York, changed from monthly to weekly. For sale by the Detroit News Company.

Last week we were so crowded with matter about the time of going to press, that we were obliged to omit our regular department of "Manufactures." It is not our intention to have this occur again.

Business Specials.

Thirty cents a line for each insertion under this head.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in. Swing, address Star Tool Co., Providence, R. I.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

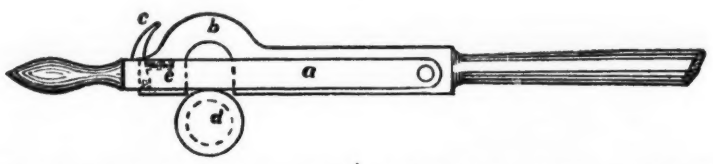
Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1). W. B., Sharpsville, Va., writes: Would you oblige by describing to me, through your valuable paper, a contrivance for lifting out of gear the ends of the eccentric rods which work on a pin connected with the rock arm? The device which I allude to has a spring and is operated by hand. I have seen them in use on large engines, but, somehow, their complete construction has escaped my memory. A. The illustration is one of the most simple and effective of any with which we are acquainted, and requires but little description. *B* represents the end or hook of valve rod; *a* is a handle with a fork which spans the valve-rod and is secured to the same by means of a pin passing through them both; *c* represents a catch which is actuated by the spring *e*. By simply depressing the catch *c*, the handle *a* is released, and the hook falls into gear by its own weight. This device does not necessitate a reduction of the bearing surface, the only point requisite being to make both the collars on the pin the same size.



(2). G. B. Kalamazoo, Michigan, writes: I am building a yacht and machinery, doing all my own work and pattern-making; I need your advice in regard to boiler. I have designed one of the following dimensions. Total height of shell 50 in.; of diameter of shell, 36 in.; height of fire-box above grate, 20 in.; width of water space, 3 in.; bottom of boiler flares out so as to use a grate 36 in. diameter; number of tubes 100; diameter of same 2 in. Some of our boiler makers consider this design too large, others, too small. Please tell me if it will do, and if not right, please give me dimensions. I want it as short and as small as possible; intend to use iron ⅜ in. thick What brand of iron would you use to work at 130 lbs. pressure per square in h? This boiler is to drive a pair of link engines with cylinders of 4½ in. bore and 4 in. stroke. Ports ¾ in. x 4 in., exhaust ¾ in. x 4 in.; speed 300 revolutions per minute; pressure in boiler 130 lbs. per square inch; exhaust into the stack. Will a connecting-rod 8 in. long be too short, or had I better use 10 in.? I shall have boiler built as you decide, for I am confident that it will be all right. P. S.—When I get started will send full descriptions, particulars of time, etc., if you wish. A. The boiler you specify has about 140 square feet of heating surface; the probable maximum H. P. of your engine, running under 120 lbs. steam at 300 revolutions would develop 12 H. P. Your boiler, is, therefore, amply large, and your grate especially is larger than is necessary for firing under a blast-nozzle. We would suggest that you save room and expense by abandoning the petticoat base, making the shell cylindrical, and showing a fire-box 30 in diameter, and 20 in. high. Try 1½ in. tubes, instead of 2 in.—say 120. It won't do for us to advertise any brand of iron. But among many other first-class brands—Penn. C. H. No. 1 Flange, with the fire-box of same brand; locomotive fire-box iron—will be sure to give satisfaction. A rod 10 in. long is just 5 cranks, which will probably be easier on your bearings than one 4 cranks long. We would be pleased to know the result of your experiments.

(3). T. H., San Francisco, Cal., writes: In your issue of June 28th, there appeared in your questions and answers No. 2, wherein J. R., Detroit, Mich., asks: Will you please furnish me with some process by which I can remove tin from copper, either pipes or sheets? The answer is, Immerse the articles in a solution of blue vitriol. I claim that this answer is not correct. A solution of blue vitriol, if weak, would not act on the tin, and if strong, it would eat up the copper first. I have practiced the following method with success for removing tin from sheet copper. Wet the tinned side with salt brine, smear the wet surface with clay, such as is used in foundries and known as puddling clay (yet any sticky c ay will answer) until the sheet is covered as if thickly painted. Heat the entire surface until it becomes a dark red. The clay will scale up and take the tin with it. Plunge it into water, and wipe the surface, when it will be found as bright as new copper.

(4). W. G. H., Graniteville, S. C., asks: Can you give me directions how to work R. Mushet's lathe tool steel? It is steel that does not require tempering. I have tried it at different colors of heat, and it flies all to pieces. Oblige a subscriber. A. This steel is much denser than any other and is 10 per cent. heavier. In heating it must be done very slowly, so that the heat thoroughly penetrates it. It is well to scrape off the fire scale after taking from the fire before forging. The tools made from it should be forged at a good heat, and in no case should it be struck with a hammer after the heat has fallen below a cherry red. After the tool is forged it should be laid down to cool, and not be hastened by dipping in water, as water will cause it to break like glass. It must be heated before cutting, as it cannot be nicked when cold.

(5) J. H. D., Cleveland, Ohio, writes: 1. The enclosed card is an exact copy of an average card taken from a single slide valve engine with 10 per cent. clearance No. 20 spring. At the time the cards were taken, the engine was competing for a premium, and the awarding committee in their report, state that the engine used 36 lbs. of water per I. H. P. per hour. The theoretical water consumption they figure at 20 per cent. less. I should like to know if this can be possible.

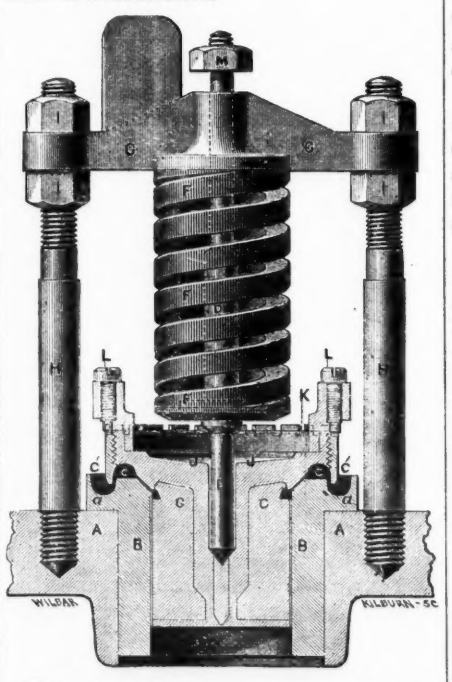
2. I have read with considerable interest the articles in the May number of the AMERICAN MACHINIST, by Messrs. Williams and Hague. I think the question of initial and boiler pressure could be accurately arrived at, by taking a diagram from the steam pipe after the point of cut-off, the steam in the pipe would rise very nearly to the pressure in the boiler, if large, short, and straight, and possibly the momentum of the steam raise it higher, but if the pressure is not maintained during induction, the indicator will surely show it, and to what extent?

A. 1. The diagram shows a mean effective pressure of 31.75 lbs., exhausting at 31 lbs. terminal pressure above vacuum. Hence its theoretical water consumption is 33.27 lbs. water per H. P., per hour, or a little less than 8 per cent. less than the actual. Or in other words, the stated actual consumption is but little over 8 per cent. more than the theoretical, a result which is quite remarkable enough to throw some doubt on the accuracy of the tests of the awarding committee.

A. 2 Your remarks as to the proper deductions from diagrams from the steam pipe are correct. Take some of them, and send them to us, with an article on the subject.

Improved Safety Valves.

In our issue of October, 1878, we published an illustrated description of the nickel seated "prop" safety valve, made by the Ashcroft M'f'g Co. Last February the Consolidated Safety Valve Co. was incorporated, and all the patents and inventions relating to steam safety valves, as well as the stock in trade and good will of the business of making and selling safety valves previously carried on by the Ashcroft M'f'g Co. and Geo. W. Richardson & Co. were transferred to the new company. We present on this page views of two styles of safety valves made by the new company. The first represents Richardson's patent safety valve attached to the dome of a locomotive.



This safety-valve is so constructed that the steam acts against it with much greater force after it lifts from its seat than before, and so effectually overcomes the rapidly increasing resistance of the spring. An ample and free outlet for the steam is by this means promptly and certainly provided at every demand.

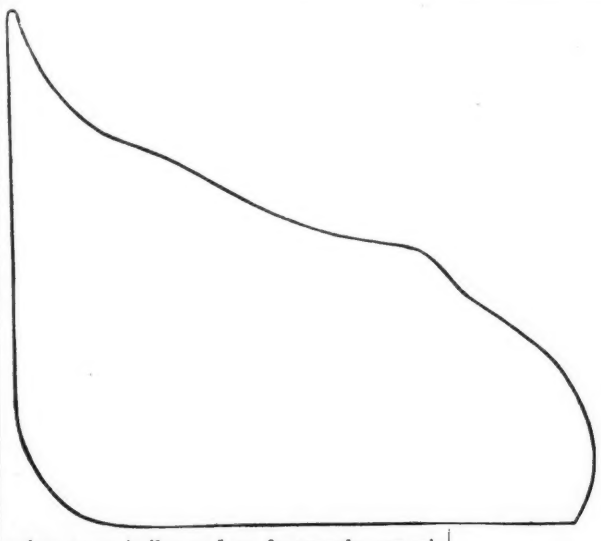
The following special points of superiority are claimed for this valve:

1st. Its construction is perfectly simple and its application at once easy and inexpensive.

2d. It has no levers or pins and so does away with all friction.

3d. It is claimed to wear longer than any other safety-valve without leaking.

4th. It is impossible to accumulate pressure in the boiler above the number of pounds at which the valve is set to blow off, although the damper may be open and the blower on. The strain from excessive pressure, so damaging to a boiler and so frequently experienced, is hereby entirely avoided.



5th. When attached to a boiler and adjusted for blowing off at a given point, such adjustment cannot be disturbed without detection. The master mechanic is, therefore, certain that no boiler is at any time carrying a greater number of pounds of steam than that which he has set the valve to blow off.

6th. It is so fitted as uniformly to close down tight after reducing the pressure from two to five pounds below the blowing-off point; therefore no steam is wasted; at the same time the valve never sticks to its seat.

7th. The spring is durable and reliable, making the valve as accurate as the best steam gauge, while it is not liable to get out of order.

These valves have been extensively used with the very best satisfaction. When differences have occurred between the indicators of this valve and the steam gauge, they have uniformly been found to arise from some unexpected defect in the gauge, the indicators of the valve proving to be correct.

The second illustration represents a style of the Richardson Safety valve, designed especially for stationary and steamboat boilers. It is enclosed in a lock-up case (brass or iron) of neat and simple device, occupying the smallest practicable limits, and is readily attached to the boiler by the ordinary flange or nipple.

When it is so applied and the valve is set for the required pressure of steam, and the case locked up, all access to the valve or spring is positively barred; nor is it possible to disturb the adjustment of the valve without unlocking and removing the cap.

The lever indicated in the figure is so arranged that the valve may be lifted by it at any time to blow off the steam from the boiler; but it cannot in any way be used to bear down upon the valve.

It is essential in ordering valves to give the size of the boiler and the highest working pressure.

LITERARY NOTES.

BERA, OR THE C. & M. C. RAILROAD, by Stuart DeLeon. The Author's Publishing Co., New York. Price 40 cts.

This is a pleasing kind of a story—one of the "Satchel Series."

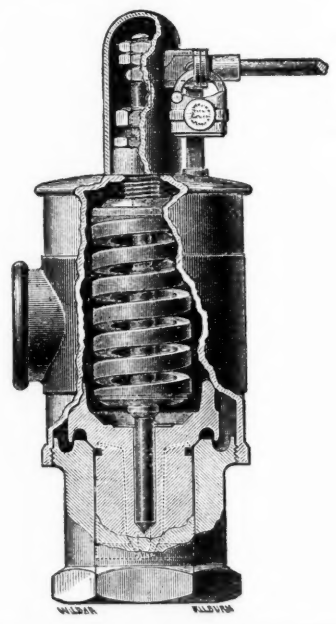
It gives a history of the ups and downs of a genteel college-bred youth who found himself, with his devoted young wife, cut off from patrimony, and obliged to shift for himself. Instead of writing a volume of poems, or seeking a situation as editor of a metropolitan daily newspaper, he applies for and obtains a position to work on the railroad. The story relates how they managed to pay the butcher, the baker, and the candlestick-maker, out of the munificent wages which everybody knows railroad companies pay their workmen, and how they managed to save something besides. He spends his evenings making drawings of links, wheels, axles, valves, etc., and is promoted from fireman to engineer, and, when the inevitable strike is projected, refuses to participate. Two or three train smash-ups are thrown in to enliven the tale. In due course of time he becomes (as might be expected) Superintendent of the road, and runs it on the intellectual plan.

The French navy has adopted an apparatus for distilling salt water at sea. The steam passes two cones, where it is aerated by being condensed in an air current. It is then purified by circulation through animal char. coal, and pure water is the result. The French Academy of Science awarded a prize of $6,000 to the inventor.

Yung man, mi general advise to you iz "Work for money." There iz now and then a man whoze opinion and friendship iz worth more to you than hiz money, but theze kind of men are skarse.—*Josh Billings.*

Capt. Eads advocates a ship "railway" instead of a canal across the Isthmus of Darien. He estimates a saving of $90,000,000 thereby.

The Illinois Railroad Commissioners have obtained returns from twenty-six railroad companies, which show that the "life" of a locomotive engine varies from 8 to 24 years, and that the general average is 15¼ years. Passenger cars "live" from 8 to 20 years, the average being 15¾ years; the average life of stock cars is ten years, and of freight cars 11½. Railroad bridges of wood endure from 5 to 20 years.



MANUFACTURES.

A new building is being erected by the Western Watch Co. of Chicago.

The C. Rogers & Brothers Company, of Meriden, Conn., are building a new factory 140 by 50 feet, and four stories in height.

H. A. Rust contemplates putting up an axe factory at Bridgewater, N. C.

The Arlington Corporation of Lawrence, Mass., are about to erect a new mill on the south bank of their canal. It is to be of brick, two stories high, 450 × 165 feet.

A bonus of $2,500 is offered by the citizens of Durand, Wis., to any good miller who will erect a good grist-mill worth $10,000. A good mill-site will be thrown in.

A new three-run steam mill is being erected at Dundas, Minn., by Robert Cochrane.

The Richmond City Mill Works, of Richmond, Ind., are about to erect an addition, 60 × 120 feet, to their already extensive shops.

The mill property at Toughkenamon, lately occupied by the Pennsylvania Hard Rubber Company, has been purchased by John C. Hand of Philadelphia, who will convert it into a machine shop,

The Hosterman property, so called, at Halifax, N. S., has been purchased as a site for a cotton factory.

The Royal Agricultural Society Show, Kilburn, London, England, closed a very rainy session on July 7. Bliss & Williams, Brooklyn, N. Y., have received a number of cabalistic cable dispatches from their representative, Mr. A. H. Fancher, ordering presses, dies and other machinery in answer to orders received through this exhibition, showing conclusively that John Bull knows a cute Yankee when he sees him. The blacksmith shops of this firm are two weeks behind their orders.

In Oakland, Cal., they are building what they call the largest ferry-boat in the world. Her dimensions are: Length, 424 feet; height in center, 18 feet, 5 inches; width over guards, 116 feet. She is a double-ender, and has four rudders at each end. Each wheel is run independently, by a separate engine. There is a great country out West.

At Bethlehem, Penn., business is greatly improved. The Bethlehem Iron Co., are employing more men than ever before, and the pay is better than at any time for ten years.

O. G. Spelman is to build a new button manufactory on the site of his old mill at Williamsburg, Mass. The structure will be 30×50 feet.

The Saxonville, (Mass.,) woolen mills are about to erect a new mill 130× 36 feet, two stories high.

The Erie Railroad is spending $750,000 for terminal facilities at Pavonia, on the Jersey side of the river. The elevator which it is building will be the largest in the world, having a capacity of a million and a quarter bushels. When these improvements are completed the Erie will be enabled to compete for through European freights with the New York Central and the Pennsylvania Central.

James Mills of Keeseville, has invented a horse-nail machine and a stock company with a capital of $50,000 has been formed at Essex, to carry on there the manufacture of horse nails by this invention to be known as Essex Horse Nail Manufacturing Company.

The business men of Halifax, N. S., are about establishing a sugar refinery in their city, and the outlook for the enterprise appears to be quite promising. The capital stock of the company is to be $300,000, and of this amount $170,000 has already been subscribed.

Eaton, Cole & Burnham's factory at Bridgeport, Conn. is running nights; the organ shop at this place is constantly crowded with work, and the same may be said of the cutlery shop and of several other establishments. It is reported that the first of next month the working force at Howe's shop is to be increased by one hundred hands. Manufacturing at Bridgeport is certainly improving.

The thread mills at Flint, Mass. are being rebuilt.

The largest elevator in the United States for Brewers' purposes is now being erected for Wm. J. Lemp, of St. Louis, by Caldwell & Watson.

A new steam flour mill is being erected at Warrensburg, Mo.

It is reported that woolen mills are soon to be established at Pugwash and Bridgewater, N. S.

Abilene, Kan., wants water-works, so does Helena, Montana, while Portland, Mich., is to spend $2,000 for this purpose.

The capacity of the Elmira, N. Y. Rolling Mills is to be doubled, and the company are to engage in the manufacture of bridges.

John Getty & Co. are building a new four-run steam flour mill at Ellsworth, Kan.

The steamer *Great Eastern*, which has long been lying at Milford Haven, is to be fitted up with new boilers and machinery at a cost of $500,000, as a cattle ship. It is estimated that she can carry 2,200 head of cattle and 36,000 sheep. She is to trade between London and Texas.

Reese, Williamson & Co., of Philadelphia, have purchased a square of ground in Camden, and will erect a large brick woolen mill thereon.

Marks & Elias, proprietors of the knitting mills, in Herkimer County, are about to build a brick addition, 120 feet long, to their establishment. When completed this will be one of the finest mill properties in the county, and will furnish employment to over 200 persons.

It is said that in the city of Peoria, Ill., over $1,000,000 is now being spent in the erection of manufacturing establishments.

C. C. Shelton will soon start a grist and carding mill at Chattanooga, Tenn. The capacity of the grist mill will be 150 bushels per day; of the carding mill 125 pounds of wool per day.

It is reported that the Messrs. Frackelton and others, of Milwaukee, Wisconsin, are to erect a large establishment in that city, to be used for the work of decorating pottery and porcelain.

The New York Belting and Packing Company, which met with serious losses by the defalcation of John G. Tappan, the Boston Belting Company's treasurer, in July, 1878, have announced to their creditors that they will pay all their notes in full on three days' sight drafts. At the time of the Boston Company's failure the New York Company were given three years' time by their creditors in which to meet their obligations. They propose, however, to take up all notes without waiting for them to mature.

The Cope and Maxwell Mf'g Co., of Hamilton, Ohio, have contracted with the city of East Liverpool, Ohio, to furnish for their water works one set of their patent "Isochronal" duplex, compound, non-condensing pumping engine and boilers complete. The engines are placed 32 feet above pumps, and are supported upon cast iron columns, which securely connect the steam cylinders and pumps together. The capacity requirement is 1,000,000 gallons of water, raised 320 feet high per 24 hours. Steam is supplied to the high pressure cylinder at 125 pressure lbs. per square inch, and is exhausted into a receiver from which it passes into the larger cylinder. The exhaust from this cylinder passes through a feed-water heater to the atmosphere. Each steam cylinder operates its own pump. The arrangement is a very novel one, and good results have been obtained as regards economy of fuel with similar machinery built by this firm. They are running full time, employing 40 workmen on steam pumping machinery alone. Business much improved.

The Philadelphia carpet factories are briskly employed. T. L. Leedom & Co. are making an addition to the main building of their establishment, 110 by 32 feet and four stories in height. The new factory of Ivins, Dietz & Magee will be in operation in time for the fall trade.

The Shepard Hardware Co., Buffalo, N. Y., are building an addition to their works, 76 x32 feet, in order to enlarge their manufacturing facilities. They will occupy it in a few days, when they will increase their force of men.

The Heywood Chair Company, Gardner, are resetting four boilers with the Jarvis furnace.

The Reading Iron Company, Reading, Pa., are soon to build a large tube mill, which will double the previous capacity of the works.

The S. Blackinton Woolen Co., No. Adams, Mass., are resetting four boilers with the Jarvis setting, and the Chace Mill, Fall River, are resetting thirty-three boilers with the same method.

The Hampshire Paper Company of South Hadley Falls are to build a new tower, a machine and carpenters' shop and a stock house 100 by 45 feet, and will make other additions and improvements to their mill.

The Farr Alpaca Company, of Holyoke, Mass. propose building an addition to their mill.

Engineers' and Machinists' Supplies.

Notwithstanding the extreme hot weather that has prevailed almost uniformly since our last issue, trade in Machinists' and Engineers' Supplies has been brisk, although not many novelties are being offered.

Few noteworthy changes in prices have occurred, but should any occur the tendency is likely to be upward. The price of Armitage "Mouse-hole" Anvils has declined two shillings per hundredweight abroad; they are quoted here at 9½ @ 9¾ cents per pound.

The manufacturers of Bolts and Nuts at a recent meeting adopted the following revised price lists for Machine Bolts, Bolt Ends, Forged Set Screws and Tap Bolts, Wood or Lag Screws, Square and Hexagon Nuts and Washers. This list shows a slight advance on the former one, and the classification is considerably changed. Hereafter all Machine Bolts and Lag Screws up to 20 inches in length, will be sold by the hundred instead of by the pound as formerly. The regular discounts to apply to this list are:

	Per Cent.
Machine Bolts	70
Bolt Ends	70
Forged Set Screws and Tap Bolts	70
Wood or Lag Screws	70
Skein Screws	70
Square and Hexagon Nuts, 8c. off list.	
Washers, 8c. off list.	

The Davis Level & Tool Co., 81 Chambers st., are introducing a new Iron Bench Level for square or straight edge. Also a double plumb and level for machinists' and carpenters' use. It has a light iron frame, is braced with steel studs, and has a plumb at each end, doing away with the necessity of reversing. It is intended to take the place of the mahogany level, being much cheaper.

This company is also introducing a new combination gauge, a tool designed for the use of machinists, model makers, draughtsmen, and others. Also a new combination caliper for inside and outside use.

Baldwin & Arnold, 96 Chambers st., N. Y. agents for Bagnall & Loud, of Boston, are introducing a new sheave, with patent bushing, for use in tackle blocks. It has seven rollers, attached in a peculiar way, instead of six, as used heretofore, for which important advantages are claimed.

Pierson & Co., 24 Broadway, N. Y., are introducing a new drill press for blacksmiths' use. They are made with or without self-feeding attachment and in five sizes. Prices as below:

No. 0,	hand-feed, each	$16 00
" 1,	self-feed, "	18 00
" 2,	hand-feed, "	20 00
" 2½,	self-feed, "	20 00
" 3,	" "	26 00

This press will be illustrated in a future issue.

The Jos. Dixon Crucible Co., Jersey City, N. J., are introducing a new lubricating compound, called the American Graphite Everlasting Axle Grease, designed for use upon shafting, or wherever a lubricator is required. Put up in packages containing 1, 2, 10, 25, and 50 pounds respectively. Also in barrels containing about 350 pounds. Claimed to be the cheapest and most durable lubricator in use.

Walton Bros., 19 Dey st., N. Y., are introducing a new lantern, lighted automatically, for the use of engineers, watchmen, railroad employes, etc. Can be lighted instantaneously without opening. Can be carried in the pocket.

W. S. MIDDLETON,
BROKER IN
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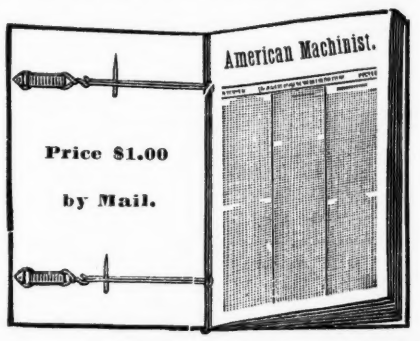

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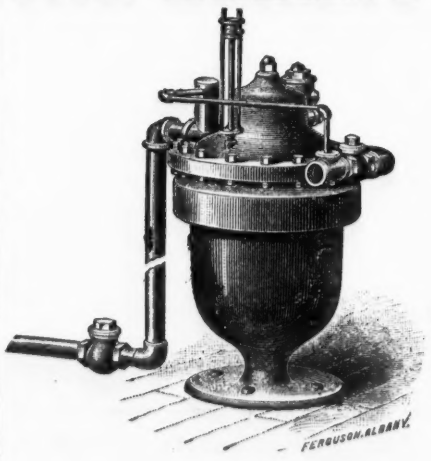

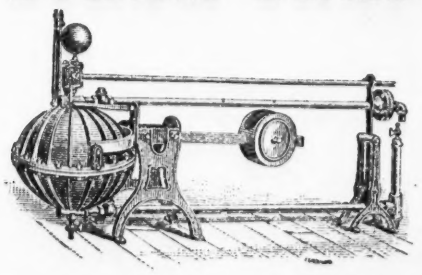
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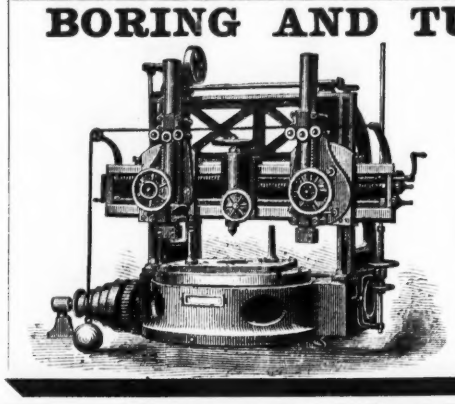

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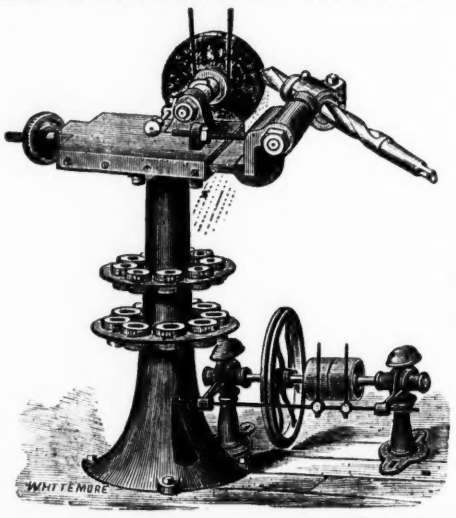

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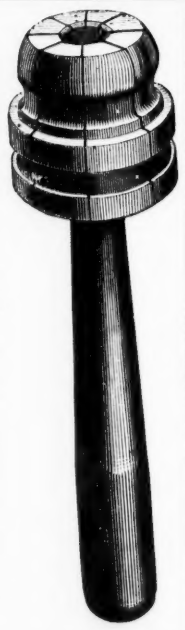

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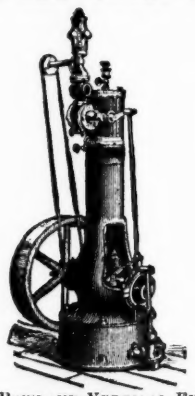

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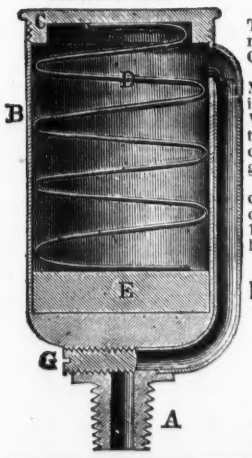

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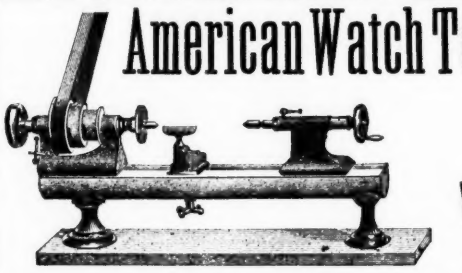

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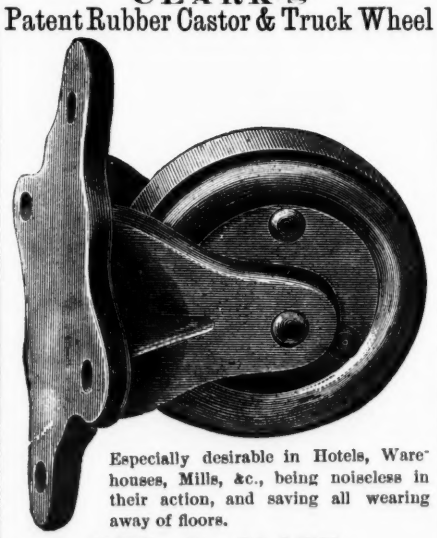

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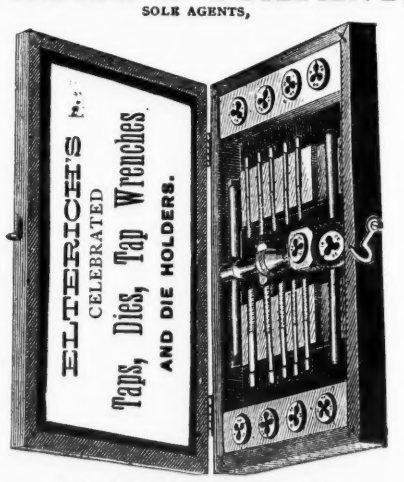

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The only change of importance that we have to note this week is an advance of $\frac{1}{10}$c. basis in Refined Iron, and a similar advance in Fish Plates. Otherwise Machinists' and Blacksmiths' Supplies continue in good demand, with prices unchanged. Railway Supplies continue in brisk demand and market firm. The rates out of store are as below: No. 1X Pig Iron $19.50 per ton; Iron Rails, $42.00 to $44.00 per ton, according to weight; Old Rails, $24.00 to $25.00 per ton; Fish Plates, $2\frac{2}{10}$c. per lb.; Railway Spikes, $2\frac{3}{4}$c. per lb.; Bolts and Nuts, $3\frac{1}{2}$c.; Common Iron, $1\frac{85}{100}$c. basis from store; Refined, $2\frac{1}{10}$c. basis; Ulster, $3\frac{1}{2}$c. basis; Machinery Steel, 5c.; Best Tool Steel, 12c.; Norway Bar Iron, $4\frac{3}{4}$c.; Norway Shapes, $5\frac{1}{4}$c.; Nail Rods, $5\frac{1}{2}$c.; Sheet Iron, $2\frac{6}{10}$c.; Angle Iron, $2\frac{4}{10}$c.; Tee Iron, $2\frac{8}{10}$c.; Band Iron, $2\frac{4}{10}$c.; Hoop, $2\frac{7}{10}$c., up; Horse Shoe, $3\frac{1}{10}$c.; Tank, $2\frac{6}{10}$c.; C No. 1, $2\frac{3}{4}$c.; C H, No. 1 Shell, 3c.; Best Flange, $4\frac{1}{2}$c.; Boiler Rivets, $3\frac{1}{2}$c. per lb. Hot Polished Shafting in lengths two feet and longer, from 5 to 6c. per lb., according to size. Small Black Rivets 50% off in papers, 35% off in bulk.

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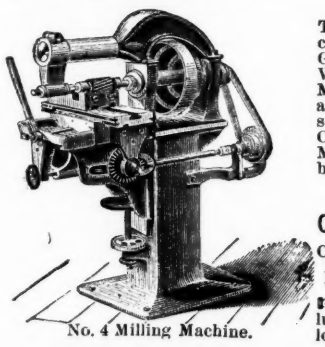

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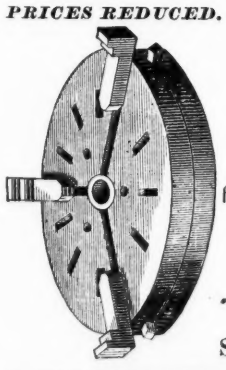

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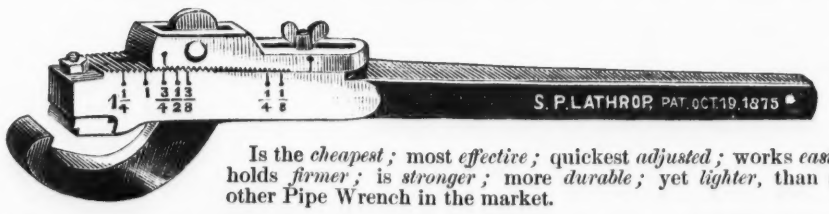

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Prof. R. H. Thurston. December, 1877.

Methods of Setting Boilers in Brick-Work.
Theron Skeel. December, 1877.

Boiler Explosions.
Stephen Roper. April, 1878.

Strength of Steam Boilers.
John W. Hill. July, 1878.

The Properties of Water.
John W. Hill. August, 1878.

Balancing Pulleys.
Geo. M. Chordal. August, 1878.

Piston Speed of Engines.
Wm. Lee Church. September, 1878.

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John W. Hill. September, 1878.

To Prepare a Shaft Properly for Turning.
J. J. Grant. October, 1878.

Practical Method of Setting the Valves of a Locomotive.
L. F. Lyne. November, 1878.

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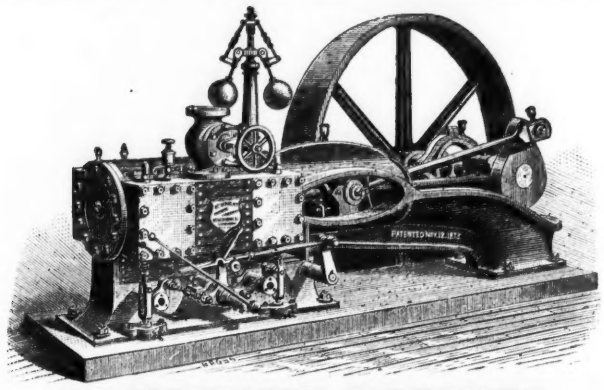

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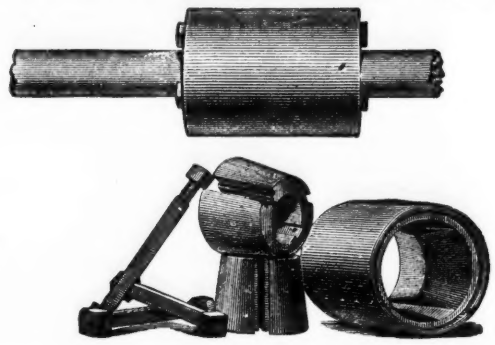

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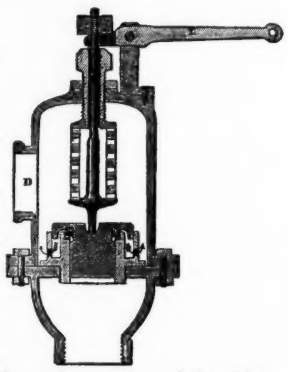

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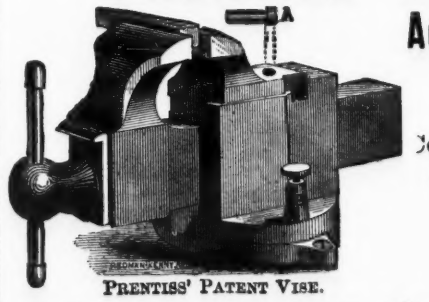

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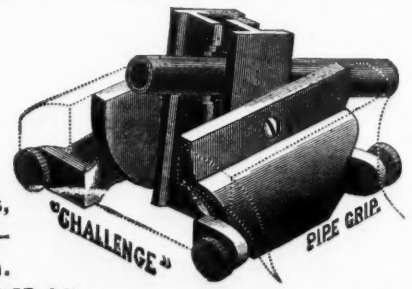

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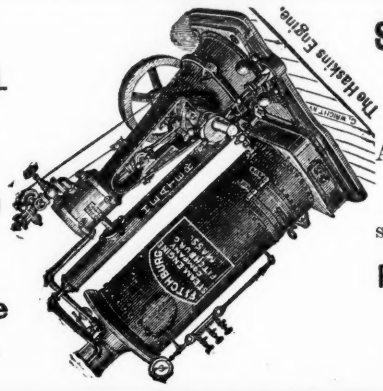

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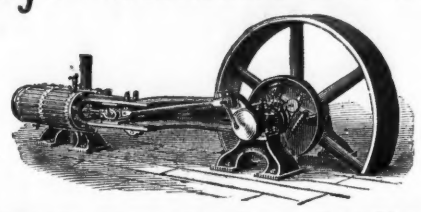

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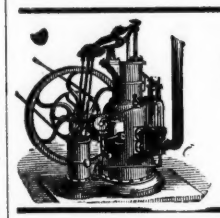

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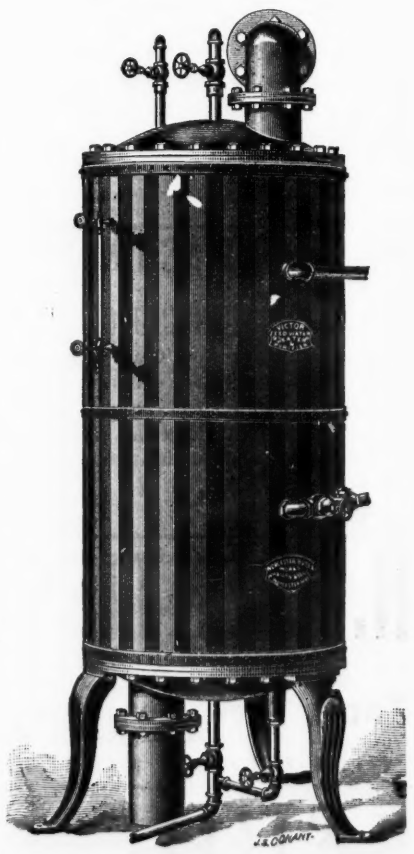

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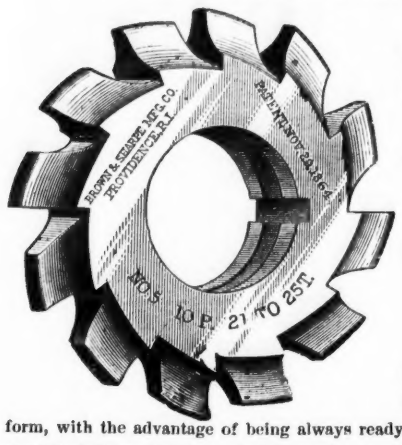

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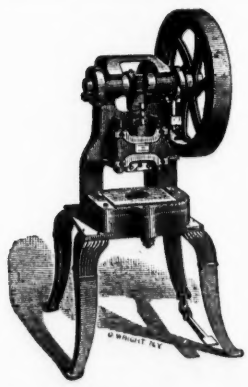

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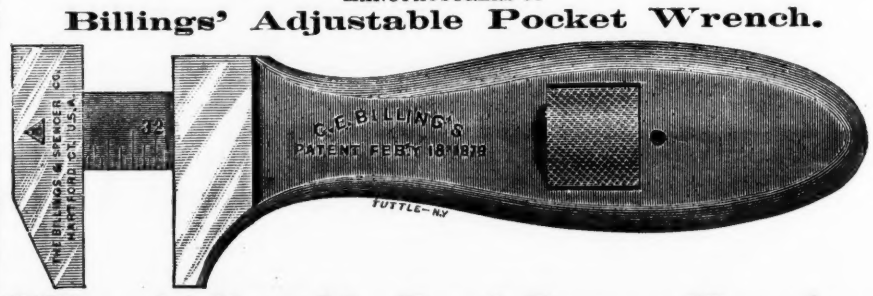

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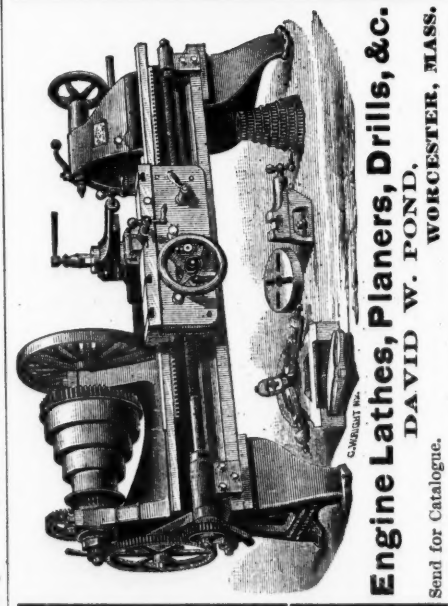

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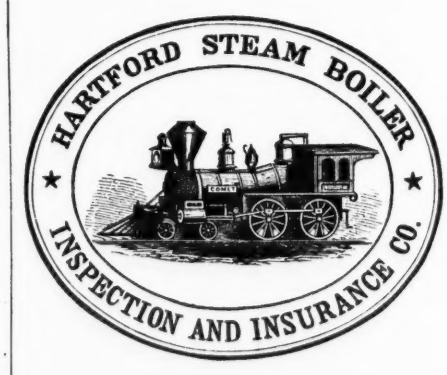

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